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Pilot Reports: CONVAIR 990 ★ DE HAVILLAND

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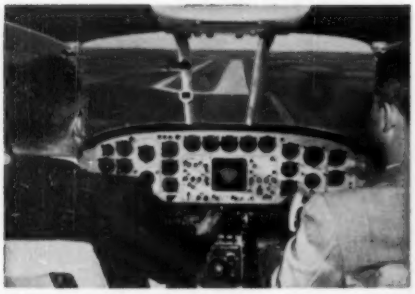

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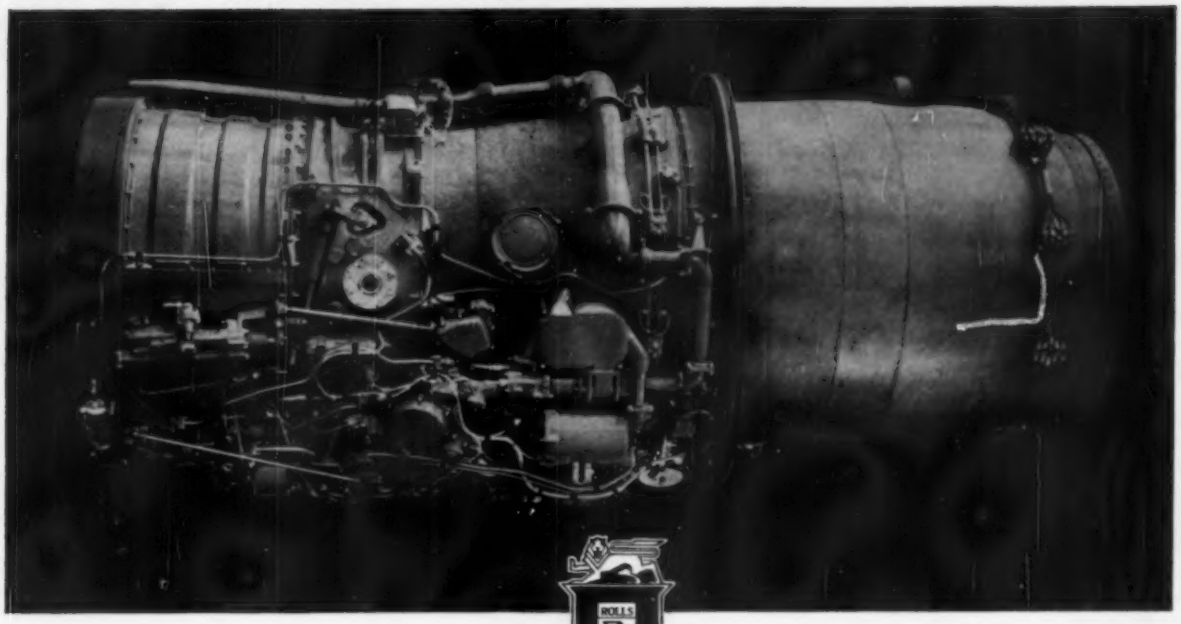

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SEPTEMBER, 1961

VOLUME 69, NUMBER 3

COVER: Capable of pushing right to the edge of Mach 1, the Convair 990 airliners incorporate rounded anti-shock bodies on the wings to ease the transition to near sonic speeds. Soon to be introduced, the aircraft will carry 121 coach passengers or 96 in first class (See pilot report p. 24).

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NEXT MONTH this magazine will feature a refreshing new plan, tieing ground to air, aimed at preventing mid-air collisions—plus a first-hand report on FAA's training procedures. Traffic safety depends on flying guaranteed flight plans, ground monitored. It means precise navigation. Building new highways to safety is SOP for FLYING.

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WINGS and THINGS

NEW TWIN CHAMPION, a low-cost airplane with fixed-gear and high-wing configuration, reportedly in the works at Champion Aircraft, Inc., Osceola, Wis. Our guess is a two-place personal/business aircraft, also suitable for student upgrading to multiengine rating at a minimum of cost.

RETRACTABLE-GEAR AIRCOUPE *now being flown at Long Beach, Calif., with certification expected this month. Carlsbad, New Mex., company designed the airplane on west coast; modifications include square-corner wing tips, additional four square feet of wing area, skin stress rather than internal stress of earlier models, continuation of conventional controls. Increase of 10 hp supplied by Continental O-200A of 100 hp. Gear and wing stressed for 200-pound increase to maximum gross weight of 1,650 pounds. Airplane may go to three-place, depending on CG. Cost will jump about $800; Air-Coupe now sells at basic $7,450.*

SIX-PLACE TURBINE HELICOPTER about to be unveiled by Hiller Aircraft Corp., Palo Alto, Calif. New rotorcraft, Model 1099, company-developed for both civilian and military markets, will be powered by a 450-hp Canadian Pratt & Whitney PT-6 turbine (see FLYING for April). Prototype, flying for several weeks, carries aft clam-shell doors for easy access of passengers and cargo.

NEW LIGHTPLANE, *now finishing certification, to be marketed by Volaircraft, Inc., Aliquippa-Hopewell Airport, Aliquippa, Pa. New Volaire is a high-wing, all-metal aircraft powered by Lycoming 0-290-D2C of 135 hp. Tricycle-geared airplane features rear window for 360-deg. visibility, forward-sweep vertical fin. Construction to cabin section is tubular; semi-monocoque aft. Certification will be three-place, with four-place version to come. Volaircraft gearing for one-a-day production; five aircraft now in various stages of completion. Cost in area of $7,500 (See picture on page 48).*

ARMY HELICOPTER competition, with a goal of more than 4,000 light observation helicopters, heightened by late entry of the Hughes 369 design, from which prototype will be produced for evaluation along with those of earlier design winners, the Hiller 1100 and the Bell D-250 (see FLYING for July). All three four-place rotorcraft will carry the Allison T-63-A-3 turbine of 250 shp.

LOW-COST TACTAIR *autopilot, the T-101, now in final stages of FAA approval before being marketed late this month or early October. The two-directional T-101, for straight-ahead flight and turns up to standard rate, is keyed to ailerons; is now flying fitted to a Cessna 182 and Beech Debonair. Selling price: $495.*

LATEST BEECH addition to its eight-plane line will be its new economy model, the prototype of which is now in construction and expected to fly by Christmas. Four-place airplane will be all-metal, with fixed-gear and low wing. Deliveries are planned for late 1962. Powerplant will be in the 150-160 hp class; speed will range to 145 mph. Price tag: between $11,000-$12,000.

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MAILBOX

ELECTROSTATIC DISCHARGES

The article "Lightning Strikes" by Mr. Viemeister in your July issue, moves me to introduce several untutored and unrequested comments into the general discussion of electrostatic discharges: their effect upon aircraft and their cause and cure.

As recently as 1955, when I went through Navy ground school at Pensacola, the official point of view was that neither lightning nor St. Elmo's Fire presented any hazard to flight. This doctrine was based upon the fact that any aircraft in flight was not grounded electrically, and therefore could not suffer harm. As you are well aware, this view has since been modified—after all, if all the reserve fuel has been lost through the holes in the tip tanks, the radio/radar/ECM equipment has been knocked out by a "disruptive discharge" within the fuselage, and the flight personnel cannot see well enough to find their coffee cups, the mission is in peril.

Several suggestions come to mind as aids to transiting areas where any form of a electrostatic discharge might be anticipated:

(1) Follow Mr. Viemeister's suggestion and turn the cockpit lights to bright white. Also drop your seat, if vertically adjustable, to the lowest position.

(2) Turn your ADF to any off-frequency setting and watch the needle; it will point to the areas of greatest electrical activity. If you do not have weather radar, this is a good guide for picking your way through a line of thunderstorm cells. Visual references may deceive you, but the "Bird Dog" points out the most interesting weather every time.

(3) Avoid interesting weather.

(4) Bright lights in the cockpit, sun glasses or instrument training hoods on the pilots help, but the easiest and, I think, best solution to the danger of temporary blindness . . . is the closing of one eye by both pilot or co-pilot, or the closing of both eyes by either member of the flight crew. . . . Depth perception is not essential to the reading of an attitude gyro, and one eye is better than none.

(5) Try a series of *unbalanced* turns to 30 degrees either side of your base heading just as your earphones indicate, by a sharp rise in the pitch of the interference, that St. Elmo is about to bowl a fire ball down the center of your ship. This technique was discovered by a chap in my squadron who always seemed to be 30 degrees off course, in a slip or skid, but it did prove out as an effective means of avoiding discharge once the static accumulation had developed on the nose, prop tips, or leading edges of the wing or control surfaces. It may be as unscientific as a rabbit's foot but it seems to work. (Any comments concerning the efficacy of this step, whether based upon theory or experience, would be appreciated.)

These observations were formed after several seasons of flying WV-2s around the North Atlantic, but I believe the suggestions would hold true for any class of aircraft . . . finding itself in conditions conducive to lightning strike or electrostatic discharge.

JOHN M. PINNEY
Bryn Mawr, Pa.

I read with interest the article "Lightning Strikes" in July FLYING.

The Flight Engineers International Assn. has in the past few years become quite interested in the potential danger and effect of lightning strikes, or static discharges, on aircraft in flight. This interest came as an outgrowth of our investigators' efforts in the crash of a TWA 1649 at Milan, Italy in June 1959.

I noticed in your article you state that only one crash of a U. S. Airliner has been attributed to lightning.

I think in the past we have all tended to ignore the potential danger of lightning because of the infrequency of substantial damage produced. However, we believe the information gathered from the Milan crash indicates the industry should re-evaluate and carefully research the effects and dangers of lightning strikes in order to alleviate any recurrence.

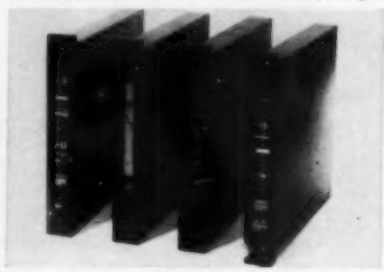
The big question in our minds today is —how many other crashes, if any, have been caused by similar circumstances?

GLENN B. IVERSON, V. P. Engineering
Washington, D. C.

KOLLSMAN INSTRUMENTS

We were certainly pleased to note the article and photo of the Kollsman "bookshelf" type instrument indicators in the June issue of FLYING.

We would like to mention that the units were developed as part of the Air Force Display Integration Program, sponsored by the Aeronautical Systems Division, Flight



Control Laboratory, Wright-Patterson Air Force Base, because the instruments are another example of the important effort being made as a result of the program to advance the state-of-the-art of presenting required information to the crews of present and future aerospace vehicles. . . .

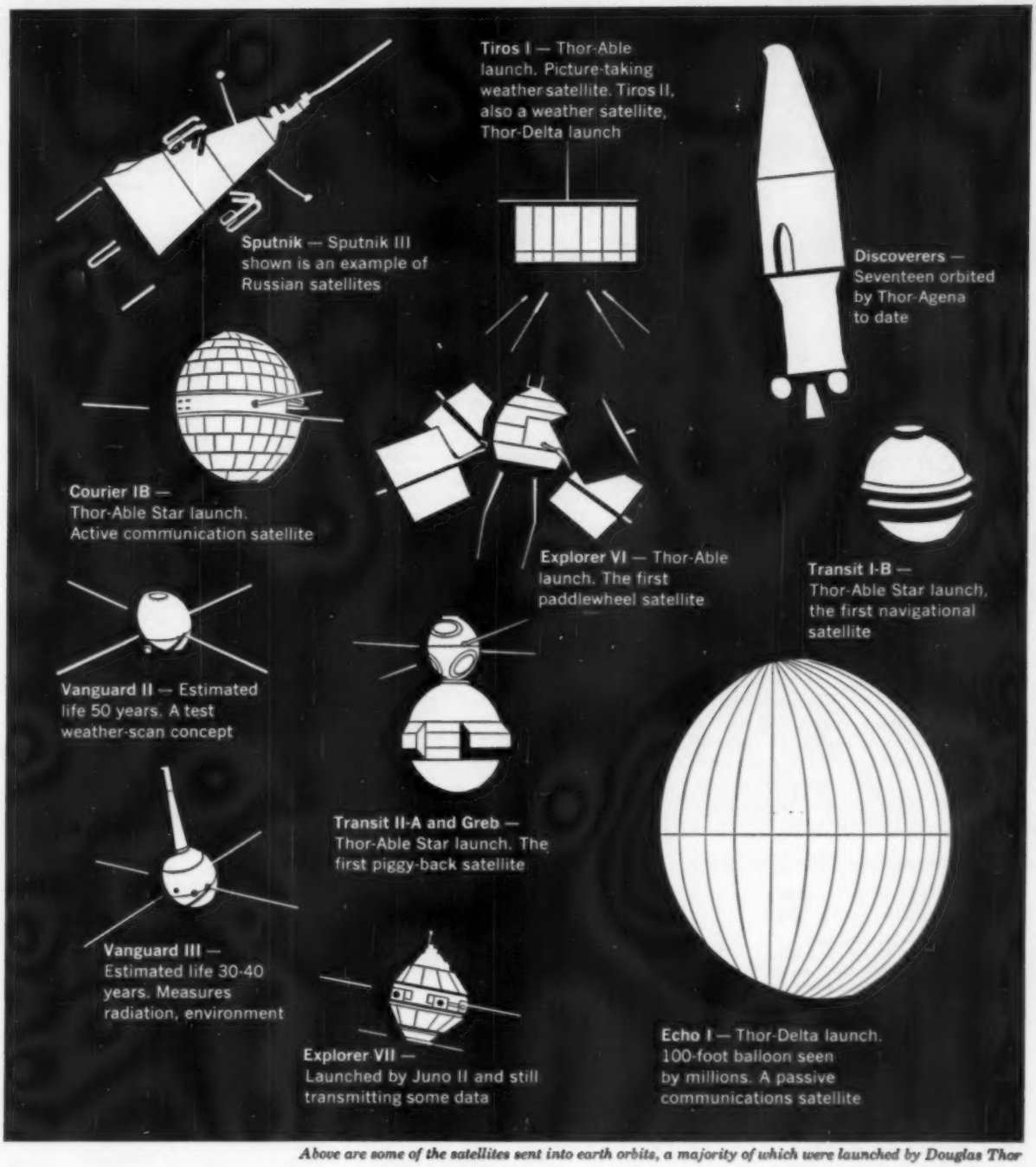
J. W. ROBINSON
Kollsman Instrument Corp.,
Elmhurst, N. Y.

BRIEFING TIME

Your editorial (July) "Briefing Time" is one of the best I have read in quite a while and also very thought-provoking. As a Reserve unit commander I find myself facing the same problem of how to get the message across to the young ones . . . when such examples are set by the older ones.

I haven't found the answer yet, but I certainly did enjoy your article. . . .

(Continued on page 6)


Tiros I — Thor-Able launch. Picture-taking weather satellite. Tiros II, also a weather satellite, Thor-Delta launch
Sputnik — Sputnik III shown is an example of Russian satellites
Discoverers — Seventeen orbited by Thor-Agena to date
Courier IB — Thor-Able Star launch. Active communication satellite
Explorer VI — Thor-Able launch. The first paddlewheel satellite
Transit I-B — Thor-Able Star launch, the first navigational satellite
Vanguard II — Estimated life 50 years. A test weather-scan concept
Transit II-A and Greb — Thor-Able Star launch. The first piggy-back satellite
Vanguard III — Estimated life 30-40 years. Measures radiation, environment
Explorer VII — Launched by Juno II and still transmitting some data
Echo I — Thor-Delta launch. 100-foot balloon seen by millions. A passive communications satellite

Above are some of the satellites sent into earth orbits, a majority of which were launched by Douglas Thor

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MAILBOX

(Continued from page 4)

As a beginning reader of FLYING and as a beginner to flying, I find many things of interest in your magazine. . . .

EDWARD I. CREED, President
C. & S. Lighting Maintenance Co.,
Cleveland, Ohio.

Bravo for your hard-hitting editorial. . . . A few might wonder why an aviation magazine should run an editorial page devoted to political philosophy but the grave problems which you put forth so clearly are life and death matters to every American, including mechanics, pilots and businessmen. I like to think that the people in the aviation industry are individuals of more than average intelligence and I'm sure that everyone of them that read your powerful editorial felt the same sense of outrage at the traitors in our midst who are pulling this country down. . . .

I hope real Americans will arise from their lethargy and create such a storm that every cockeyed socialist scheme and their advocates will be swept into the ash barrel where they belong. Hit them again, Sir, and hit 'em often!

JOHN HUBBELL
Newtown, Conn.

I like the tone and the ideas of your July editorial, "Briefing Time." Keep up the good work. You are producing a highly satisfactory magazine—I am glad to have it coming regularly into my home.

DAVID A. DENSLOW, Pastor
First Methodist Church
Williston, Fla.

. . . . I want to go on record as stating that it's one of the best editorials I've ever read . . . Certainly there is no more appropriate place for your words than a magazine dedicated to aviation. Those of us who have pushed a throttle forward and climbed toward the heavens have a peculiar aversion toward the ideal of losing our liberty. No one who has flown . . . could be happy at seeing the American Eagle with clipped wings.

However, we need many more articles and editorials like yours before our citizens can be awakened. Their apathy is staggering. . . .

The time to fight is now. The battleground for each is his own community . . . The weapons we must use are the ballot box and the strength of enlightened public opinion. . . .

MARVIN BRYAN, EXECUTIVE PRODUCER
Wonderland Productions,
Hollywood, Calif.

I want to tell you of my unusual interest and pleasure in reading your editorial "Briefing Time."

. . . Our Administration chooses to tell us only . . . of the greater benefits that it is trying to secure for us, but there is no hint of the cost. Any "briefing" such as you have in mind in your editorial explains the risks and possible costs in addition to the possible gains . . . Unfortunately such a real briefing would not be popular . . .

The day when our Federal government will tell each of us where we must work and at what wage is not far off.

What administration would dare include that in its "briefing"?

LINCOLN B. FRAZIER
Campbell Supply Co.,
Marquette, Mich.

I have just read your "Briefing Time," and my most immediate reaction was a heartfelt "Amen." Then I read it again. Thank you for putting into words some very recognizable thoughts . . .

BURT H. GOULD
Johnstown, N. Y.

. . . "Time for Briefing" should be required reading for every American.

Many of us possess the principles to abhor traitorous actions of those protected by overly generous laws. Few of us have the courage, energy and facilities to condemn them publicly.

Your dedication to a cause not currently in vogue is an example for all.

W. C. HOFFMAN, Vice President
Reece Wooden Sole Shoe Co.,
Columbus, Neb.

QANTAS RECORD

I was quite interested in R. F. MacMillan's article "Qantas, The Down Under Airline," in your July issue.

Qantas did not pioneer the South Pacific route in 1947. The credit for that achievement should go to their competitors, Australian National Airways and Captain Holimann, the farsighted head of the airline which inaugurated the first transpacific passenger flight from San Francisco to Melbourne, Australia in the early part of 1946.

A.N.A. purchased six of the first post-war DC-4s from Douglas Aircraft Company and after sending the first, along with a cargo of spare parts, the second plane left San Francisco with a full passenger list and a scroll from the Mayor of San Francisco to the Lord Mayor of Melbourne commemorating the first flight.

The route was from San Francisco to Honolulu, then to Canton Island, Suva (Fiji Islands) and finally Melbourne.

The total flying time was about 33 hours and total time en route approximately 54 hours. The American crew members included Ben Garlow, pilot; Rudy Horstmann, navigator and Elbert Wilkinson, radio operator. The Australians were Capt. Harry Baker and Flight Engineer Ted Auston.

ELBERT WILKINSON
Santa Maria, Calif.

THE B-36

I have just finished reading "The Big Bad B-36" in the July FLYING. It is the most entertaining story I have seen in an aviation magazine in the last several years.

If this is a sample of Mr. Naugle's writing, I hope we may see more of it. (If he was in the USAF, I'm sure he is no longer).

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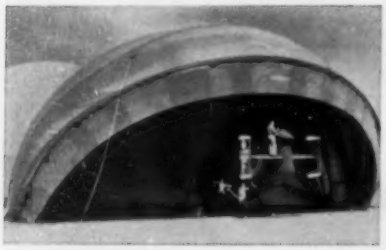
BRIEFINGS...

A "new look" in the military airplane hangar is this unique portable, inflatable maintenance hangar developed for the Army Quartermaster Corps. Half-oval in shape, 80 feet long, 70 feet wide, this experimental shelter stands 36 feet high at the center and consists of a coated fabric



skin over an auxiliary semi-rigid frame. A one and one-half hp., high volume, low pressure blower inflates and stabilizes the structure. The fabric skin, developed by Alden Rubber Co. of Philadelphia, Pa., is a special neoprene applied to either nylon or dacron base material. The complete structure weighs less than 7,500 pounds.

Letter contracts totalling approximately $5 million for additional T-37B jet aircraft have been received by Cessna Aircraft from the USAF. Receipt of this order will extend production of this two-place side-by-side, twin-jet, Continental-powered trainer into mid-1963. Cessna has already delivered some 600 T-37s to the USAF Air Training Command.

Lockheed-Marietta, Ga., is building a research aircraft that, like a hummingbird, will fly straight up, straight down, hover in midair, fly straight forward—at jet speed. The project is part of the Army Research Transportation Command's effort to increase the Army's combat and logistic capability on the modern battlefield. As envisioned, the "Hummingbird" will be a two-place mid-wing monoplane, powered by two turbojet engines of 3,000 pounds thrust each; 25 feet 8 inch wing span and overall length of 32 feet.

An additional regional office for the Southeastern states will be opened in Atlanta, Ga., January 1, 1962, charged with responsibility for FAA activities in Georgia, Florida, North and South Carolina, Tennessee, Alabama, Mississippi, Puerto Rico, Virgin Islands and Swan Island. These were previously under FAA's Fort Worth, Tex. regional office. In the shift, Ft. Worth takes over the State of New Mexico from the Los Angeles region. Addition of the Atlanta office brings the number of FAA regions to seven; five to serve the contiguous 48 states; one each for Alaska and Hawaii.

Limited production of the Fairchild F-27 twin-turboprop transport has been announced by Fairchild Stratos Corp., Hagerstown, Md. The renewed program involves manufacture of an improved version of the F-27F with certification by FAA completed in time to permit first production models to be delivered in early Fall.

FAA Administrator Takes A Dive—Versatile Najeeb Halaby *(right)* made his first free fall parachute jump at Orange (Mass.) Sport Parachuting Center to experience first-hand the training and thrill of "Sky Diving," now becoming so popular as a national sport that Federal rules to encourage it and at the same time protect the public are in the offing. Sharing the sky with Halaby were: (l to r) Crocker Snow, director, Massachusetts Aeronautics Commission (second timer) Joseph Richardson, Boston executive (first timer) and host Jacques Istel (foreground) making his 526th leap. Halaby landed only 10 yards from bull's eye, was "thrilled."

First quantity deliveries of Narco's new Distance Measuring Equipment (DME) for the general aviation market rolled out of Ft. Washington, Pa., in mid-June, and by July 1, 60 units were in the hands of FAA and Narco's regional wholesalers. Designated the UDI-2, the new Narco DME, developed under an FAA R&D contract, tells the pilot on a standard instrument dial his airplane's distance from a Vortac ground station and has a range of 100 nautical miles. The unit weighs 14 pounds and sells for $2,250. Narco reports the highest backlog in its history at the start of shipment of any new equipment.

By courtesy of Beech Aircraft Corporation all pilots who learn to fly in a Beechcraft model of any type are eligible to receive a plaque with the pilot's name, date of solo, model and number of the airplane. First to receive their "first solo" plaques were Mr. and Mrs. Owen McEwen (center),

parents of seven children (the oldest 12 years). They learned to fly in their new Bonanza, under instructor Jack Nixon (left) at United Airplane Sales, Wichita. Ralph Floyd (right), president of United, presented the plaques. McEwen is vice president and secretary of Steffen Dairy Food Company, Wichita.

Medical facilities at civil airports throughout the country are subject of a current survey by a four-man team from FAA. Initiated to determine whether the existing facilities are adequate to cope with potential emergencies and routine health requirements for passengers, air crews and ground personnel, the survey will include large and medium traffic hub airports and several small hub airports in certain areas. Purpose of the study is to provide operators with constructive guides for appropriate planning.

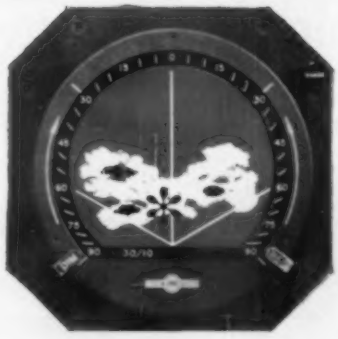
Business firms may now lease the Helio Super-Courier STOL-type airplane through a joint marketing-lease program entered into by the Helio Aircraft Corp. of Norwood, Mass., and the American Industrial Leasing Co., of New York, Chicago and Los Angeles. Under the program the five-place Super Courier may be leased for three, four and five-year periods, with renewal option, for an initial down payment equivalent to three, four or five-month fees depending on length of the lease.

The Umbaugh 18 Gyroplane has been issued its Type Inspection Authorization by FAA, thus clearing the way for flight certification tests, the final step to an Approved Type Certificate. The T.I.A. signifies approval of all Umbaugh engineering data

(Continued on page 96)

COLLINS WEATHER RADAR presents a complete picture of the weather ahead, showing the smoothest route through or around storms. Not restricted by "tunnel vision," it scans a broad 120° sector of the sky (360° with 30° antenna), with ranges up to 150 miles ahead.

The WP-103 X-Band Radar weighs only 48.8 pounds – the result of a new design with extensive transistorization. It features a 12°, 18° or 30° stabilized antenna providing a clearly defined picture on the indicator, regardless of aircraft pitch and roll. For hoodless, daylight viewing, a bright tube indicator is available. Write for a detailed brochure.



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DALLAS, TEXAS • NEWPORT BEACH, CALIFORNIA

COLLINS

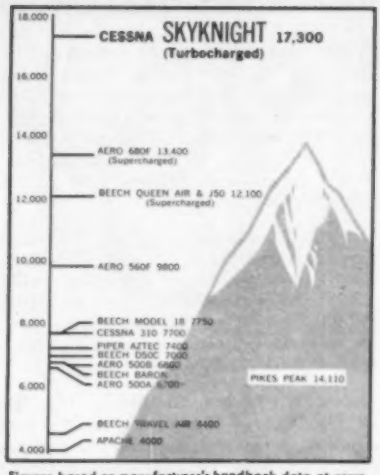
ANNOUNCING THE WORLD'S FIRST TURBOCHARGED BUSINESS TWIN: CESSNA'S SKYKNIGHT

Cessna's turbocharged Skyknight flies at 27,200 feet and maintains full 520 h.p. at 16,000 feet. It's the only light twin that clears Pikes Peak (by 3,000 feet) on one engine. Price? $30,000 less than any other high-altitude twin.

See column next page—and then your Cessna dealer. At the airport, look for the Cessna pennants, sign of extra Cessna service at over 375 dealers around the world. Here: Sun Valley Air Service, Phoenix, Arizona.

SKYKNIGHT 310
THE EXECUTIVE TWINS

MEN WHO KNOW AIRPLANES FLY CESSNA



Figures based on manufacturer's handbook data at gross weight—standard conditions.

TURBOCHARGED SKYKNIGHT—the only light twin that can clear Pikes Peak on one engine with over 3,000 feet to spare.

Cessna's turbocharger takes in thin air . . . compresses it to sea-level density . . . and packs it into both fuel-injection engines. *Result:* each engine maintains full 260 h.p. up to 16,000 feet. You get speeds up to 265 m.p.h. . . . a nonstop range up to 1,430 miles with auxiliary tanks . . . and an over-the-weather service ceiling of 27,200 feet *—17,300 feet on one engine.*

A QUIET, LUXURIOUS 5-PLACE CABIN lets you work or relax in complete comfort. Plenty of room to stretch out or move around. (One example: you get 3½ inches more cabin height than in the popular Cessna 310.) Four big windows on each side give you panoramic view. And you can choose from 4 seating plans and 4 interior color schemes.

PRICE? Just $67,500. And a new plan at your Cessna dealer's makes it even easier to buy. One example: you can buy a new Cessna 150 for as little as $750 down—including *free* flying lessons.

FOR A DEMONSTRATION FLIGHT, call your Cessna dealer now. (See Yellow Pages.) Look at all 13 models . . . starting at $7,495. Lease plans also available. Or for further information, write: Cessna Aircraft Co., Dept. F-10, Wichita, Kansas.

All prices with std. equip., f. o. f. Wichita

CESSNA

13 BUSINESS AIRCRAFT

NEW PRODUCTS

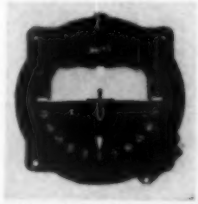
Commercial availability of a new and improved aircraft windshield rain repellent, the RR 990, as a successor to the Foster D. Snell Repellent Kit has been announced by the Regal Air Corp., 500 Fifth Avenue, New York. The new product, developed under a Navy Bureau of Aeronautics contract, may be used on glass or acrylic windshields and requires no preparation other than a clean windshield. Its efficiency has been demonstrated at speeds up to 700 mph, it is reported. Costing $10, it includes repellent—enough for 30 applications on transport type aircraft—glass cleaner, glass cleaner rinse and cleansing tissues.

Latest additions to Motorola Aviation Electronics' instrument line are two three-inch air-driven, self-erecting, spillproof gyros — attitude and directional — with built-in electrical pickoffs which supply heading and attitude information to the autopilot.

Completely new in design and construction, each instrument weighs 2.7 pounds and fits a standard instrument panel cutout. Motorola offers them as optional equipment on new L-2 autopilots and for retrofit installation in existing systems at suggest list price per unit of $795.

Self-powered, low-priced 3-light marker beacon, Model FMR-2, has been introduced by Fran Air Products, Pawtucket, R.I. (Box 478). The FMR-2 uses seven transistors and two tubes; requires no external power except direct connection to aircraft's 12- or 24-volt power supply. Weighing about 16 ounces and measuring 4 x 6 x 1½ inches, this unit features volume control, horizontal or vertical mounting and press to test and light dimmers. Priced at $167.50 it carries a six months guarantee.

Vecto Instrument Corp., Houston, Texas, is now manufacturing a gyro horizon under model designation SD-2307, developed for improved utilization both in flight training and regular operations of single and light twin-engine aircraft. Said to be the only flight instrument of its type directly related to exact aircraft attitudes in roll, pitch and turn, the instrument axes cover 230 degrees of roll and 90 degrees of pitch. The SD-2307 price is under $400, through all Vecto dealers.



"Aluma-Last," a new protective coating that prevents discoloration and corrosion of aircraft aluminum skin, is being marketed by Aircraft & Airport Services, Inc., Detroit Metropolitan Airport, Mich. A liquid which, when applied (by spray or brush) dries quickly to a flexible, transparent finish, Aluma-Last is unconditionally guaranteed not to chip, peel, crack or turn yellow.

Zenith Radio has introduced the Royal 790, new Super-Navigator, a 3-band all transistor portable radio engineered to provide long-range reception of FAA air weather stations and radio beacons, standard broadcasts, plus marine weather-navigation bulletins, ship-to-shore communications, time signals, CAP broadcasts, etc., on 2 to 5.0 mc band. Self-powered, the Super-Navigator is also a standby navigation instrument for homing and LF range navigation, has a NAV switch for build and fade orientation, and sharp nulls; an azimuth scale for cross bearings. In a black top-grain cowhide case, the Super-Navigator is priced at $99.95, minus batteries. Earphone attachments are available at extra cost. Zenith Sales Corp., Chicago, or dealers.

Combining a miniature computer (1¾ inch in diameter) with a steel tape, Parmele Navigator, Bettendorf, Iowa., has come up with this pocket-size computer tape called the "M-2". Tape measures up to 360 statute miles on a sectional chart and 720 miles on the WAC chart. Back of the steel tape is imprinted with useful pilot information. The Computer Tape comes in red plastic case. Price, $2.95.

Childers Manufacturing Co., Houston 8, Tex., is offering an "executive" hangar of mass produced cold formed structural sections, rather than conventional structure steel. Fully enclosed for "lockable privacy", Childers' hangars have a substantially flat roof, are of nut and bolt assembly, and come in two sizes to accommodate nearly all single-engine and many twin-engine aircraft. Doors are five-section top-hung units. Prices installed are quoted as little as $1,800 per plane.

The Men and Machines That BUILT Your Engine Originally Are Best Qualified to Restore It to Like-New Condition

THESE FACTORY EXPERTS ARE AT YOUR CALL

Continental's Factory Re-Manufacture Program, successor to the periodic overhaul, backs you with the specialized skills of the men who built your engine—the men who know it best. Neither their experience, nor the precision machines and instruments implementing it, can be matched outside the Continental plant. Continental's Re-Manufacture Program gives you new engine safety and dependability, new engine warranty, new log book with zero engine hours—in a fraction of the time required for overhaul, and at modest predetermined cost. You're back in the air with absolute minimum of down time. Write NOW for the information that can save you important money when overhaul time rolls round again!

ALL CONTINENTAL AIRCRAFT ENGINE MODELS ARE AVAILABLE AS FACTORY RE-MANUFACTURED ENGINES

Continental Motors Corporation

AIRCRAFT ENGINE DIVISION . . . MUSKEGON, MICHIGAN

WHO and WHERE

August Esenwein, former executive vice president of Convair, has been elected president of the Aerospace Industries Assn., to succeed General Orval R. Cook (USAF-Ret) who has announced his resignation as of Dec. 31, 1961. In the interim Mr. Esenwein will serve as AIA's deputy general manager, beginning Oct. 1.

Jack F. Ramsberger, chief of information for the National Air Transport Coordinating Committee, New York area's noise abatement organization, has succeeded Vice Admiral C. E. Rosendahl (USN Ret.) as executive director. Admiral Rosendahl retired from NATCC June 30.

James W. Vaughn, Clarksville, Tex.; Dr. Philip Roos of Austin; F. Earl Wilson, Tucson, Ariz., and Kenneth R. Rodgers, Cape Giradeau, Mo., have joined Coffing Industries, Inc., St. Louis, as special sales and service representatives on the Coffing 3-D Artificial Horizon.

Richard C. Vogel has taken over management of Cessna Aircraft's East Coast Branch with offices at Morristown, N. J.

Arvin O. Basnight and Paul H. Boatman will head staff at FAA's new Atlanta, Ga. regional office as assistant administrator and deputy assistant administrator, respectively.

General E. R. Quesada (USAF-Ret.), former FAA Administrator, succeeds Dr. Theodore P. Wright as chairman of the executive committee of the Cornell-Guggenheim Aviation Safety Center, Washington, D. C.

Maxwell Balfour has been named president of Spartan Aircraft, Tulsa, Okla. B. B. Broome is named sales representative of the firm's Aviation Service Division.

Frank R. Demchock is appointed to the newly created position of general sales manager and ass't. director, Sales and Service Div., General Precision, Pleasantville, N. Y.

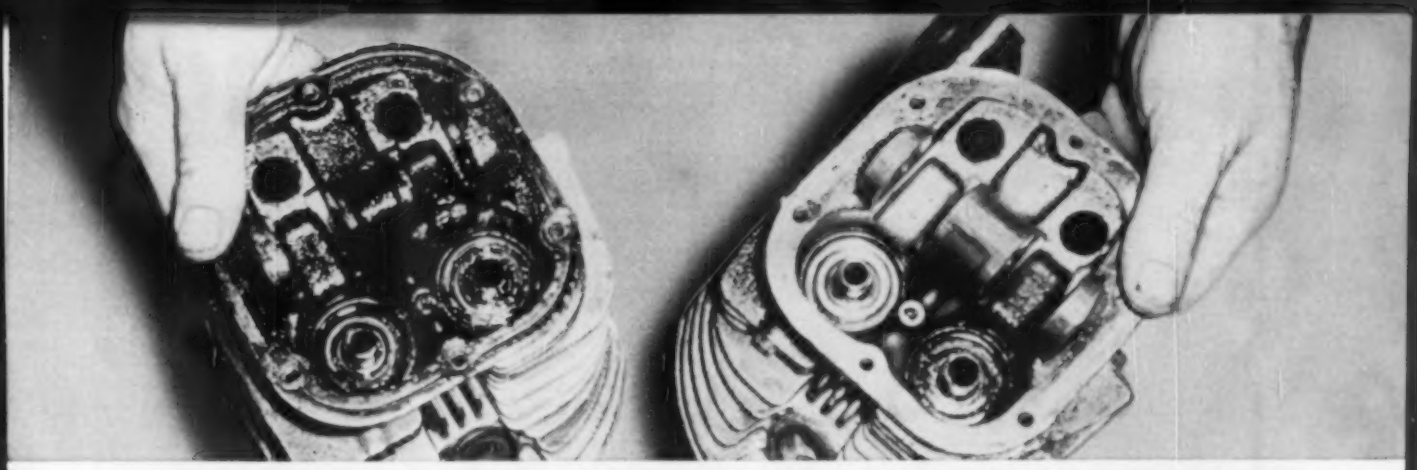
Col. J. Carroll Cone, recently retired as assistant vice president, public relations, PanAm after 23 years with the airline, has opened his own consulting firm in Washington, D. C.

Currie B. Davis, former administrative assistant to William Hopkins, president of the Tusco Corp., has been named marketing director for its Navion Aircraft division.

Robert E. Mays, formerly with Lear, Inc., has joined Motorola Aviation Electronics as western regional sales representative—a territory covering 13 states, Alaska and Hawaii included, and western Canada.

James T. Duffy Jr. has taken office as president of Brantly Helicopters at Frederick, Okla. N. O. Brantly remains board chairman.

Dr. James L. Goddard continues with FAA as Civil Air Surgeon for an additional two years, heading the Aviation Medicine Service (Bureau of Aviation Medicine). Dr. George R. Steinkamp has been named deputy Civil Air Surgeon.



Dramatic proof of AeroShell Oil W stability. Rocker box section (left) ran for 250 hours using a good straight mineral oil. Rocker box (right) ran over twice as many hours on AeroShell Oil W. Note remarkable cleanliness.

BULLETIN:

Shell answers the ten questions you might ask about AeroShell Oil W—world's first non-ash dispersant aircraft oil

Less oil consumption. Longer intervals between engine overhauls. Easier starting, faster warm-up, reduced wear on piston rings, cylinder bores, cam lobes, lifter faces, gears and bushings.

All these benefits have been obtained with new AeroShell® Oil W. Here, in handy question-answer form, are the facts.

1. What types of aircraft can use AeroShell Oil W? Piston engine planes of any size. Helicopters, too.

2. Why is it called a non-ash dispersant oil? Because it contains special additives that help keep tiny, ingested particles in the oil from clumping together and forming deposits. These particles remain suspended and dispersed until they burn.

3. How does this effect engine performance? It means that engine parts stay cleaner. That lubrication points get all the oil they need. *Your engine runs more efficiently, parts last longer.*

4. What about oil consumption? Because AeroShell Oil W means decreased wear and a cleaner engine, you can expect less oil consumption.

5. Can AeroShell Oil W reduce my maintenance costs? If you have been using a straight mineral oil, AeroShell Oil W can reduce your maintenance costs substantially. Reason: your engine runs cleaner and cooler. Oil consumption is less. Thus, you can extend intervals between engine overhauls.

6. How does this new oil respond from a cold start? AeroShell Oil W has an unusually high viscosity index. This guards against excessive thickening of the oil when cold, yet provides outstanding lubrication when hot. Result: *easier starting, faster warm-up.*

7. Is AeroShell Oil W thoroughly proved? Thoroughly. It's had millions of engine hours of flight time.

8. Where is it available? At Shell Aviation Dealers everywhere. *Any* dealer will stock AeroShell Oil W if you ask for it.

9. Can I add AeroShell Oil W as a make-up oil? Yes. It is compatible with all piston engine oils now being used.

10. Is there more than one viscosity grade? What do I ask for? AeroShell Oil W is available in *three* viscosity grades: 80 grade for small engines where straight mineral oil grade 55, 65, or 80 is normally recommended. Also in 100 and 120 grades for large engines where straight mineral oil grade 100 or 120 is normally recommended.

FREE technical bulletin on AeroShell Oil W at your request. Write: Shell Oil Co., 50 West 50th St., New York 20, N. Y.

SHELL

A BULLETIN FROM SHELL
—where 1,997 scientists are working to provide better products for industry

NOVEMBER 28, 1929

Yesterday — A flag-draped rock fell from the belly of a Ford tri-motor and plummeted to the Antarctic ice fields below. The exact spot was the South Pole. The event — Commander Richard E. Byrd's historic first flight over the pole. The fuel—Standard Red Crown Aviation gasoline.

This feat of aviation pioneering by Commander Byrd and his crew marked another Standard "first" — one of a continuing series in which Standard played a part, beginning in 1917, when we supplied the first successful aviation gasoline in the U. S.

Today — famous Chevron Aviation fuels and RPM Aviation Lubricants help power international jet fleets . . . give safe dependable performance for commercial, business and private pilots everywhere. Standard's forward-looking research is developing new products for tomorrow's aviation. For example: a fuel that can withstand in-flight temperatures of better than 450° while powering Mach-3 commercial jets.

From "jennies" to jets — in the development of supreme quality aviation products Standard is first!

Chevron Airport Dealers take better care of your plane — at over 300 of the West's leading airports.

STANDARD OIL COMPANY OF CALIFORNIA

Five Passengers Ride in Comfort

A dynamic new aircraft to better serve your *going* needs . . . it combines all of Navion's traditionally fine qualities of stability and durability with exciting new beauty, speed and cabin luxury. All 5 passengers travel in "living room luxury" with fully reclining chairs and plenty of leg room. Deluxe comfort features include airliner-type ventilation, extra thick sound proofing and genuine leather trim. You'll enjoy flying the Navion even to its full range of 1800 miles. Speeds up to 200 mph . . . and, the Rangemaster's full instrumentation makes flying safe in almost all weather conditions. Other bonus features include 34 gallon tip tanks as standard equipment and a new over-sized door on the left side where it belongs (for easy entry and exit by the pilot as well as the passengers). There's a lot more to the Navion story, so send for free copy of our new color folder showing why Navion is the new standard of value for your business and pleasure flying.

the performance-packed 5-passenger Rangemaster

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FOR ALL PILOTS

SAFETY AND PRECISION IN IFR AND VFR NAVIGATION

More than just a place to write, OMNIBOARD'S compact versatility eliminates cockpit confusion and pilot fatigue . . . places everything neatly, at your fingertips. **APPROACH DRAWER** for full view of approach plates, check lists, avigation charts . . . ideal for storage . . . locks in or out. **CLIP-COMPUTER** (optional) clips to board for use in place or detached. **RETRACTABLE ROTO-LIGHT** (optional) swivels full 360° for red or white illumination of board or instrument panel. **WRITING ANGLE ROTATION** for natural, uncramped writing position. **PENCIL CLIP** holds pencil ready for use . . . removes and replaces easily, without looking. **ENROUTE FLIGHT LOGS** that simplify flight planning and navigation . . . hold-open top and bottom clips. **IN-FLIGHT INFORMATION** printed on board; clearance shorthand, radio frequencies, Morse Code. **APR EXTRA FEATURES:** dual pencil storage, pencil sharpener with shaving container, comfortable contoured leg saddle, flexible non-slip strap.

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HAVE YOU READ?

By JAMES F. SUNDERMAN

SABRES OVER BRANDYWINE, by Lt. Col. David F. McCallister, USAF (Res.) and Lindy Boyes (Hesperian House, 722 Montgomery St., San Francisco 11, Calif., $3.95).

On June 4 of this year, one month before publication of his novel on jet flight, David "Snapper" McCallister pulled up the wheels of his T-33 for the last time. Three miles beyond the end of the Scott AFB runway the jet engine flamed out, and in a moment of tragedy the airman's world lost one of its most intriguing, skilled, colorful personalities.

Snapper was a product of the jet age, a lean, lanky, hawk-eyed "jet jockey" in the fullest sense of the term. WW II fighter pilot, AF Reservist active with the Maryland Air National Guard (Commander, 142nd TAC Fighter Squadron, ANG), 1956 winner of the annual Ricks jet event, test pilot and author, these were hallmarks of an airman loved, respected and admired by flyers everywhere.

Snapper was wanted, and what more can any one ask. When he was around, the conversation just naturally drifted to flying. And never a man walked the earth more articulate of the world aloft, for flight was his life completely—an ingredient of every one of the minutes he lived, and he lived hard every one of them.

For him the world was small. It was his oyster, and the people in it were to be enjoyed. His chatter sparkled with the intriguing phrase and jargon of a new breed in the sky.

Although it won't happen now, we can't imagine Snapper ever getting old and not being able to fly. We like to think in the words of Gill Robb Wilson, that he was one of the "happy band that loved life most, too much to hoard it for some distant day, when years have rusted all of us away."

A copy of Snapper's book Sabres Over Brandywine was placed in the bier at Arlington Cemetery. It deals with a "weekend warrior" AF Reserve fighter unit called to active duty and combat during the Korean War. It will take you up into the high world of jet flight where the image of a great guy will be on your wing.

MIGHTY THOR: MISSILE IN READINESS, by Julian Hartt (Duell, Sloan and Pearce, 124 E. 30th St., New York 17, N.Y., $4.50).

In a short decade and a half since WW II, technology has changed the face of military air weaponry. But certain research and development fundamentals remain constant, for example the lead time in weapon development. The USAF Thor Intermediate Range Ballistic Missile broke all records in this department. Under a crash program Thor evolved from drawing board to operational readiness in three years. Sixty now stand operational ready in England, while Thor has become the principal vehicle in America's exploration of outer space.

The story of this fantastic military-industry achievement, surrounded by the raging political and inter-service controversy (Thor vs. Jupiter), etc., is superbly related here by the Aerospace Editor of the *Los Angeles Examiner*.

WORLD AIRCRAFT ILLUSTRATED, edited by John Underwood (Aero Publishers, 2162 Sunset Blvd., Los Angeles 26, Calif., $8.50).

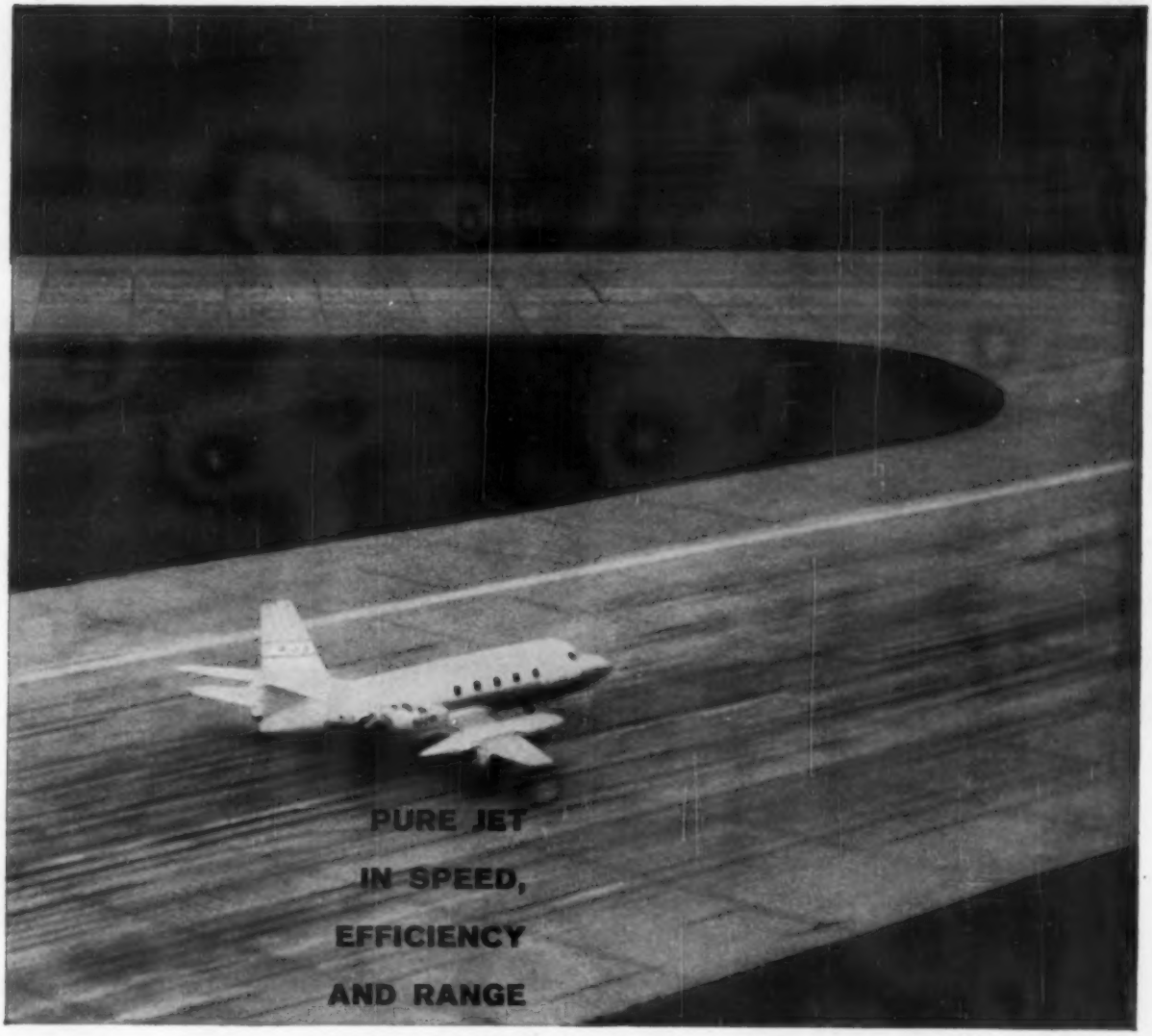
For quick reference-research this photostatistical encyclopedia presents 440 pictures of 1960-1961 civil and military aircraft of all nations of the world, including the Iron Curtain countries. Statistics include manufacturer, type aircraft and construction, powerplant, crew and passenger capacity, design and operational specifications, and brief history of each aircraft.

JOURNEY OF THE GIANTS, by Major Gene Guerny (Coward-McCann, 210 Madison Ave., New York 16, N.Y., $4.95).

Vast distances involved in the Pacific in WW II made carrier and land-based aircraft the predominant weapon. Fighters and fighter/bombers chewed along with the ground forces inching from Guadalcanal and New Guinea northward. The mediums (B-25s, B-26s) and the heavies (B-17s and B-24s) ranged out ahead to soften targets, pave the way for advancing surface forces. But it was the giants of the war, the VHLR (very heavy long range) B-29s which decisively struck the heart of Japan, gave the Empire the coup d'etat, long before military experts predicted it would capitulate.

The complete story of the B-29s is told here in fresh, vivid and authentic terms, from the aircraft's concept on the drawing boards in 1937, to its introduction to combat in 1944, through the combat offensive, launched first from airfields in China proper, later from the Central Pacific. The urgency of the war required that crews test and debug the aircraft on combat missions, and this they did with heartbreaking losses. Ironically when the war ended the B-29 was a fully tested weapon.

Perhaps of most significance is the fact that the "Superfort" and the men who flew it drew up the fundamentals to strategic aerospace power today. Major Guerny writes the details of this magnificent chapter in our history in a down-to-earth style that will attract young and old alike.



—YET IT CAN OPERATE FROM FIELDS OF LESS THAN 5,000 FEET!

Four Pratt & Whitney Aircraft JT12 turbojet engines power the Lockheed JetStar, world's fastest corporate jetliner. Each of these efficient powerplants weighs but 436 pounds yet develops 3,000 pounds thrust. This high thrust-to-weight ratio contributes to the JetStar's short field take-off, a climb of 4,000 feet a minute and a cruise speed of 500 to 550 miles per hour at up to 45,000 feet. The same experience that has produced jet engines which power the majority of the world's military and commercial jet aircraft developed the JT12. Its simple, rugged design ensures high reliability and easy maintenance. And it is backed by Pratt & Whitney Aircraft's world-wide service.

Pratt & Whitney Aircraft

Division of UNITED AIRCRAFT CORPORATION East Hartford, Connecticut

ONE FULL YEAR WARRANTY

on ***all*** parts and components ***plus*** a warranty on labor for the first ninety days

King Engineering has proved so sound—King Quality Control has proved so effective that *one full year warranty* now stands squarely behind every part and component in all equipments now being produced by King Radio Corporation, plus a warranty on labor for the first ninety days.

This warranty includes tubes and transistors, **a feature never before offered by any manufacturer of aircraft radio equipment.**

Your King Certified Dealer (the expert who installs your equipment) or any other of the King Certified Dealers listed in our new world-wide Directory will give you prompt, qualified service wherever you are.

See your King Certified Dealer today for full information on this ONE FULL YEAR Warranty—and ask him for your copy of the King world-wide Dealer Directory so that wherever you fly you will know the King Certified Dealer who is nearby; or write direct to King Radio Corporation, Olathe, Kansas for your copy. Contains all King Certified Dealers, world-wide, plus complete information on the New ONE FULL YEAR WARRANTY.

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OLATHE, KANSAS

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Builders of TOMORROW'S Aircraft Equipment TODAY!

A LOW PRICED FOUR-PLACE PLANE

WITH LOW WING STABILITY, LANDING EASE, VISIBILITY

Now, at last, the features you could only get previously with much more expensive airplanes are yours at lowest price in the Piper Cherokee, features possible only with modern low wing. To name a few — wide-tread tricycle landing gear and low center of gravity for the hug-the-road stability on landings (where it counts) . . . amazing "ground cushion" approaches . . . safety visibility (no blind spots in the turns) — all thanks to the Cherokee's low wing.

In other ways, too, the Cherokee's low wing puts this new all-metal, four-place plane years ahead of competition. Its clean, cantilever, laminar-flow design gives best all-around performance—quick take-off, excellent climb and over 130 mph on economical power (Lycoming 150 or 160 hp). And even more important are the easy-to-fly characteristics that have drawn raves from flight test pilot-writers evaluating the Cherokee.

Don't settle for anything less than a modern, *low wing* Cherokee. Prices start at $9795. See your Piper dealer or write for Cherokee brochure, **Dept. G-9, Piper Aircraft Corporation, Lock Haven, Pa.**

YOU'LL BE AMAZED at the Cherokee's big, big cabin, almost as big as the Comanche (and that's the biggest of all single-engine 4-place planes!) Big 19-cubic foot baggage compartment, too.

PIPER *Cherokee*

A Weapon for the Free

GILL ROBB WILSON
Publisher

THE ARTICULATION of dedicated men is an irresistible force.

The first demand of tyranny always is for silence, ironclad silence.

But there is another silence—the silence of lethargy. And today this silence is of more concern to us than the policed silence of Soviet socialism.

We of aviation are hard schooled in the matter of dedicated articulation. From Kitty Hawk to Canaveral, from Mitchell to LeMay, our history has been one of struggle for articulation against apathy, fear, cynicism and ignorance. We had to fly in the minds of men before we could fly expansively in the heavens. And articulation is the work of men, not organizations. Reasoning, exhorting, warning, inspiring, challenging, a relative handful of individuals built American air-power.

I suggest that a leaf from our experience might apply to the problem faced by every harassed American today —the salvage of our government from organic cancer. I propose that the ramparts of free speech be manned and that as individuals armed with articulate convictions, we countercharge this disguised barbarism which would make us mendicant minions of the state, without pride and without dignity.

To organize to this end prematurely is poor strategy. Organization invites punitive reprisals, ridicule, misinterpretation, internal dissentions. Organization plays the enemy's game.

Let us remember that before our forefathers could organize to speak as "We the People," and proclaim "inalienable rights," the articulation of such as Thomas Paine, Patrick Henry, Samuel Adams and Benjamin Franklin had to pave the way. The United States is the product of men who would not be silenced. The dignity and freedom of the individual is our genius. I propose that it is reincarnated.

If this seems idealistic, did it prove so to them? Mark that our political administrations, local and national, are almost universally borderline choices, many of them made possible by apathetic opposition or ingenius organization. None is invulnerable. None is remote. From the White House to the lowliest Justice of the Peace, not a single official is immune to articulate citizens armed with deep conviction. They yield to the pressure of special interests because there is a vacuum of articulation in opposition. The vast majority wish to be good servants. In addition to being good conscience, it is good politics. But how does one interpret the silence of the dedicated with the shouts of the self seeking a tumult in the ears?

I doubt that anyone is so naive as to believe that the Kremlin is enemy No. 1. That position is reserved for those internal influences which are driving a wedge between the law and the people. O'erweaning taxation is bringing the citizen to look upon government as an enemy. Political cynicism is challenging the citizen to regard partisanship as a more profitable alliance than patriotism. Divisive opinions of the Supreme Court are testifying that we live not under law, but under legalism. Respect is being destroyed wholesale by the misuse of government in domestic affairs. Pride is being outraged by expediency and compromise and temporization in foreign affairs.

Would a Hoffa with impunity have told Theodore Roosevelt to jump in the creek? Would a Castro have mocked John Adams? Would a combination of executives conspire to fix prices in the face of a White House they respected? Would a foreign official have suggested "pay or else" in the Congress of a Daniel Webster? Would Abraham Lincoln have apologized for invoking the law to stave off national disaster?

The target of our salvation is not 5,000 miles away. It is here. Moscow is only the circling buzzard waiting for the carrion of our dead dreams. Mr. "K" said as much. He did not say we will kill you. He said we will bury you. Nor can it matter much who buries us if the genius of the great experiment in personal freedom under law is already drained away. And it well may be unless each of us in the majesty of our birthright, entitled to a voice, becomes articulate of our heritage.

Nor let any dedicated one complain that he lacks the power of articulation. A single word is mightier than an atom bomb to turn back socialism in America.

The word is "no," reiterated and reiterated by each of us in the place where we stand—in the cockpit, at the kitchen sink, by the factory lathe, over the executive desk—until heaven thunders and God hears and those who play at being Messiah are deafened.

Then an old pilot may turn to his wings again in peace. Hasten the day!

Dear American Airlines:

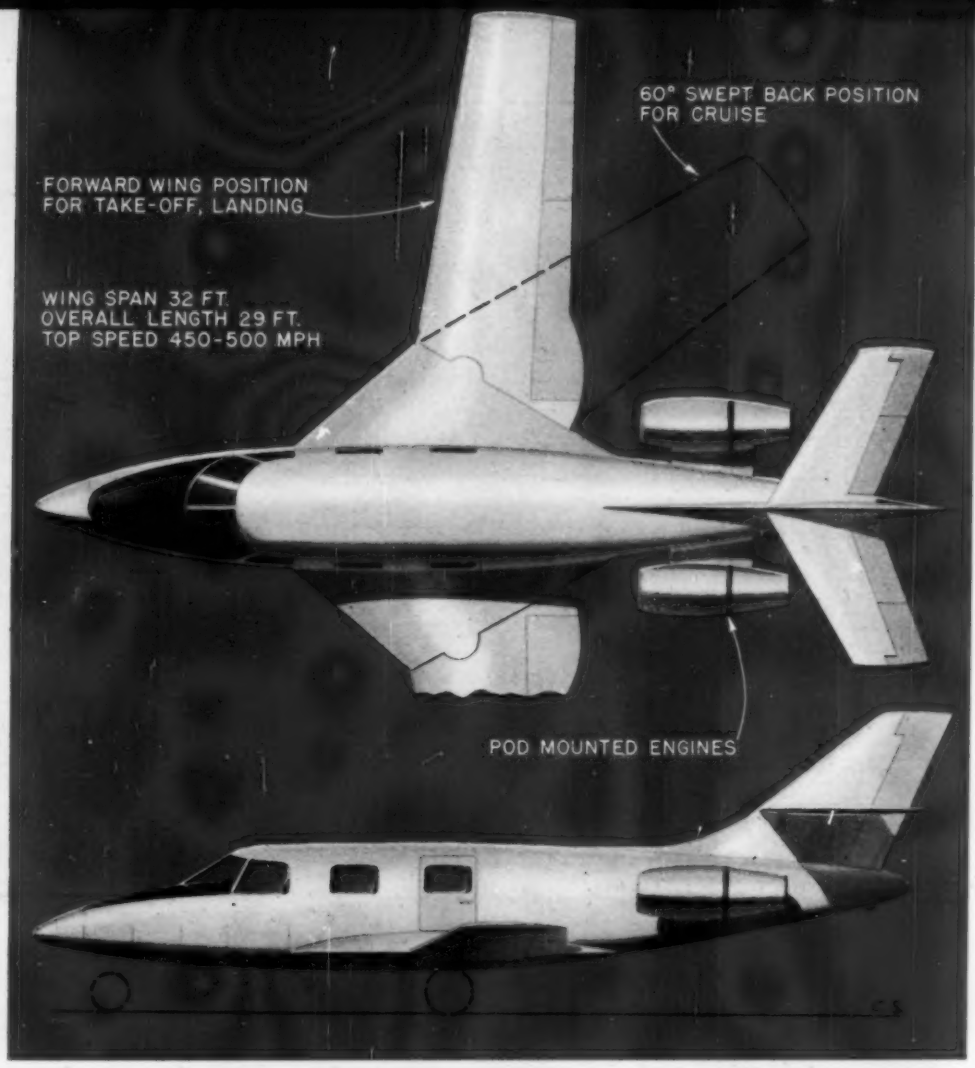
Recently your reservations people helped me complete a lengthy trip with an involved itinerary. Their graciousness and knowledge were exceptional. It was a pleasure to have their help.

Chris D. McKeon

UNSOLICITED LETTER FROM MR. C. D. MCKEON, MCKEON CONSTRUCTION CO., SAN FRANCISCO, CAL.

The voice of American, Mr. McKeon, is friendly and expert at solving travel problems. Even in busy vacation months, our standard is to answer 90% of our phone calls in 20 seconds. Prompt, courteous service is a good reason why American is *first choice of experienced travelers.*

AMERICAN AIRLINES
America's Leading Airline



Executive aircraft can use variable sweep as shown to increase airspeed 40 per cent over straight wings.

A solution to the dilemma of how to provide top performance at high cruising as well as low approach and landing speeds

VARIABLE SWEEP WING AIRCRAFT

By J. S. BUTZ JR.

UNTIL RECENT YEARS aircraft designers have had no way to obtain good low-speed and high-speed performance from the same airplane. Transonic airplanes, such as the North American F-86 or the Boeing 707, could not be designed to land and take off like a Cessna 310. The landing problem on supersonic airplanes has been even more difficult.

It always has been necessary to reach a design compromise between low and high-speed flight requirements. If an airplane's primary mission was to fly faster than 500 mph, then it was necessary to accept high landing speeds and long ground runs during takeoff and landing.

Happily, there now appears to be a workable solution to the high speed–low speed dilemma. This solution lies in the variable sweep wing which can have its angle changed in flight. During landing and takeoff the wing would be straight with zero degree sweep. Then an internal mechanism would sweep it back to an angle of 45 degrees or more during high speed cruise.

Theoretically, no one has ever doubted that the variable sweep wing would solve the high speed–low speed problem. The high speed advantages of highly swept wings have been known for 15 or 20 years; the poor lifting efficiency of these wings during low speed flight also has been understood. It always has been considered desirable to use straight wings at low speeds, if possible.

However, the first attempts to build a variable sweep wing and put the theory to practical use met with failure. It has been only within the last year that the majority of aircraft industry and government aviation authorities have agreed that a variable sweep wing can be successful.

Many tests with small models by aircraft manufacturers and government laboratories have been necessary to overcome the adverse opinion of variable sweep wings which was created in the early 1950s by two airplanes. The first of these was the experimental Bell X-5. The Bell Aircraft Co., the Air Force and NASA's predecessor, the National Advisory Committee for Aeronautics, cooperated in its design and construction. Two X-5s were built and flown.

The X-5 had one major fault. Its wing had to be shifted forward as its sweep angle was increased from 20 degrees to 60 degrees. The elaborate mechanism required to do this was too heavy to be used on an operational airplane. It was absolutely imperative to move the wing forward as the sweepback angle increased; otherwise the aircraft would become excessively stable due to the shift of the wing's center of lift well aft of the airplane's center of gravity. If this excessively stable condition were created, it would be impossible to control the airplane with a normal size horizontal tail.

The other U. S. variable sweep wing airplane was the Grumman XF-10F, experimental fighter for the Navy. This airplane was flown extensively, but it never lived up to its predicted performance. Although the XF-10F was an improvement in many ways over the X-5, it also suffered from stability troubles, and its wing translation and sweep mechanism was a heavy weight penalty.

In spite of the problems encountered with the X-5 and the XF-10F, a group of researchers at the Langley Laboratory of the NACA did not abandon their original conviction that variable sweep could be made to work with great effect. The group had consulted closely on both of the variable sweep test airplanes and had done some of the preliminary thinking that led to the X-5. During the late 1950s they kept a small study project on the concept going.

In 1959, these researchers, then a part of NASA, announced to the industry that the stability and weight problems of the variable sweep wing were solved:

- The problem of excessive stability was licked by moving the wing pivot point farther out on the wing and carefully shaping the wing root. The object of the shaping was to keep the wing's air flow moving over the tail in a never-changing pattern as the sweep was increased.
- Once the stability problem was out of the way, the wing could be swept to the rear without being moved forward. This meant that it would have to be moved about a single pivot point, and this would permit structural weight to be reduced significantly.

The NACA's Bell X-5, which flew in 1952, was the first variable sweep wing aircraft in the air.

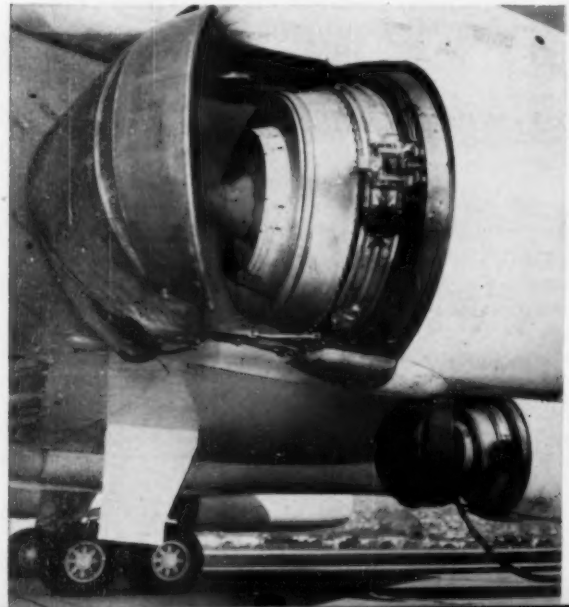
Using this new Langley research as a starting point, most U. S. aircraft companies have renewed their studies of the variable sweep wing. Some of the companies have conducted wind tunnel programs and research studies on variable sweep wings that are larger than the one undertaken by NASA. Most of the company studies have been extremely encouraging and have wiped out the original doubts about variable sweep wings.

The majority of the company studies have been aimed at the design of two airplanes that the government apparently intends to build. These two airplanes which have spurred variable sweep (*Continued on page 56*)

Takeoff distance with fuel aboard for 2,000-mile flight is 5,350 ft.

Wings incorporate leading edge slats, Krueger leading edge flaps.

Left: Author Don Germeraad and John Knebel in cockpit. *Below:* Clamshell doors set for reverse thrust. They retract along the pod.



PILOT REPORT

About to be introduced into airline service, this 96-passenger transport has transoceanic range capability and speed approaching Mach 1

CONVAIR 990

By DON GERMERAAD

WE HAVE FLOWN the Convair 990 almost at the speed of sound—to Mach .97. This is faster than any other transport has ever flown.

In today's era of manned flight to the fringe of space the speed of sound may seem to be a point which was passed long ago and which is now somewhat old hat. It is, for an astronaut who has been trained and conditioned for months and years to be blasted aloft by an experimental device to achieve hypersonic velocities.

The difference, of course, is that the 990 is a transportation system which will be certificated in a few short months to carry children, housewives, businessmen, oldsters and youngsters—day in and day out—over the world's airways at transonic speeds. Its relatively great speed—for a transport—will be secondary to the fail-safe design and rugged reliability which is the first requisite of any passenger carrier.

Actually, the 990 when it goes into service in December on American Airlines in the United States and on Swissair, S.A.S. and REAL overseas—will be limited to Mach .91 and a maximum still air cruise speed of 640 miles an hour. During the flight test program we demonstrate substantially higher speeds to provide a cushion

Fuel is jettisoned in flight from the outboard anti-shock bodies, which also double as fuel tanks. Fuel dump rate is over 2,000 pounds per minute.

over the air carriers' operating limits.

That is why we put N 5601, the first Convair 990, through a series of demonstrations which culminated in the Mach .97 record.

In such testing a pilot always counsels himself: "make haste slowly." When an airplane is being flown near its design limits, each speed increment is added only after a thorough exploration of the preceding one. Our approach with the 990 was no different.

However, there is another complicating factor connected with flight at or near Mach 1. At such speeds the air no longer behaves in a normal fashion. The effects of sonic shock waves are such that Mach measurement is extremely difficult.

The procedure requires that the subject aircraft—in this case the 990—be flown at high Mach number wing to wing with a calibrated pacer. We utilized the services of an interceptor aircraft whose instruments had been closely calibrated over measured courses. By a series of such flights with the pacer we were able to determine the proper numbers which we could use to correct the readings on the 990's instruments. This done, we were able to proceed out to a full .06 beyond the Mach .91 for which the 990 will be certificated.

There were five of us aboard on these flights. With me were J. W. Knebel as copilot (he normally commands another of the four 990s now in the flight test program); A. E. Hunt, flight test engineer; R. J. Dunn, instrumentation engineer; and R. M. Bloom, flight engineer.

Older jet transports built for slower speeds tend to do a fair amount of shuddering, buffeting and shaking when they are test flown at or near their design limits. We were pleasantly surprised in taking the 990 to within three per cent of the speed of sound to find that these adverse effects were negligible. It was easier than flying earlier jet transports at much slower speeds. At the 22,500-foot altitude flown the Mach number translated to 675 miles an hour true airspeed.

There are a number of sound design reasons why this is so. The chief one is the use of aerodynamic anti-shock bodies—four aerodynamic shapes on the upper surface of the wings. More on these later.

During this phase of flutter testing, we also checked out the low-altitude, high dynamic pressure "Q" range of critical aerodynamic stresses to higher speeds than those flown by any other transport. We reached 462 knots indicated air speed (*Continued on page 74*)

"Ushered into the plane, I made a mental note to wear slacks in the future."

Wind in my petticoats

IT ALL BEGAN one brisk November day in 1959 when my husband Ralph came home for lunch and asked, "Betty, how would you like to learn to fly?" Absentmindedly I said it would be fun.

"We're due at the airport in half an hour for our first lesson so we'd better hurry," he went on to say.

My mouth dropped open. Flying! He couldn't be serious! "First lesson?" I asked. "Flying? But Ralph . . ."

There just wasn't time for any more "Buts" and before I had time to fully digest the news, let alone lunch, I found myself headed toward the airport.

The 20-minute ride to the airport gave me a chance to think about things a bit. Me, a flyer? How absurd. It seemed something too remote to even think about. I had lived through many hobbies with Ralph since we were married, but this latest seemed a giant step by comparison. Oh well, I reasoned, surely today's lesson would entail learning a few basic facts on the ground first. What fantasy that was!

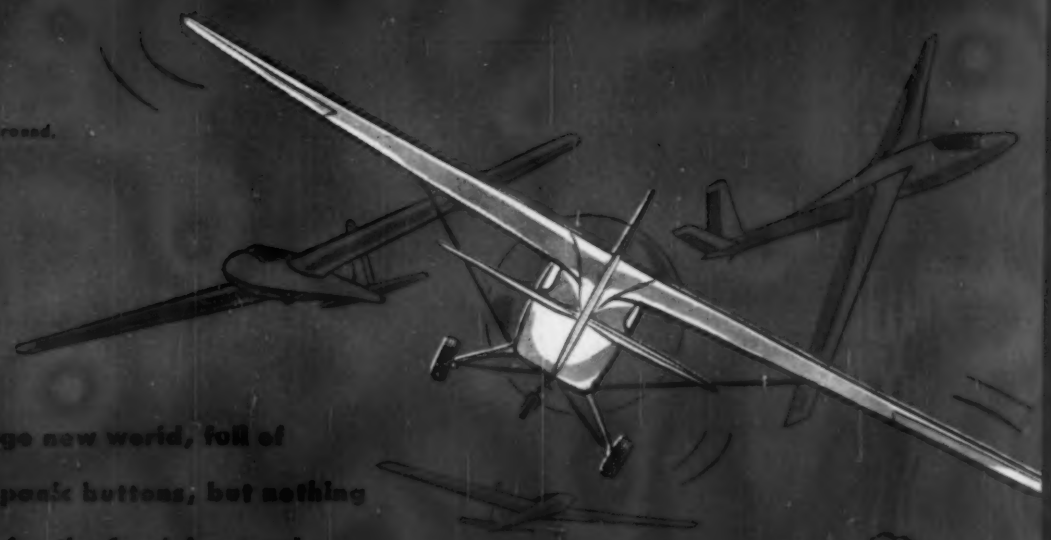
Before I could be certain I wasn't dreaming, we had arrived. Straight ahead was the beautiful and spacious five-floor terminal building Chemung County had just completed. The control tower sat squarely on top where it commanded a 360-degree view of the surrounding countryside and sky. As we approached the fence separating the parking area from the airfield, I spotted the three paved runways stretching out like black ribbons.

Ralph parked the car and we hurried excitedly toward the Elmira Aeronautical Corporation building, looking with mounting enthusiasm at all the activity. There we met the three instructors who have the job of making fliers out of neophytes—John Matkosky, Bill Robbins, and Bill Johnson. John showed us around the hangars as we admired the various private planes. A Mohawk 440 taxied up to the terminal building nearby, and the two of us stood there gaping, entranced with the overall picture.

John coughed politely to recapture our attention and asked, "Would you rather train in a Cub or a Tri-Pacer?"

The blank look on our faces must have convinced him that we were two greenhorns from the word "go." We definitely didn't know a Tri-Pacer or Cub from a hole in the ground. He patiently explained the difference. Silently I questioned the dented ceiling the size and shape of a head in the Cub's interior and wondered what story could be told concerning that. The Tri-Pacer, Five One Delta, won wings down since it had a heater to ward off the cold of the day and no dented ceiling.

"'All right now, Mrs. Hoosloop, pull gently back on the wheel' 'Who? Me?' I shouted above the roar."



"Three sailplanes were dead ahead. Boating haphazardly around, as I went downwind."

It was a strange new world, full of tangerine juice and panic buttons, but nothing insurmountable for the feminine touch

By BETTY DENNE HAESLOOP

Ralph was the perfect gentleman. In a grand manner he said, "Betty, ladies first." John didn't waste any time waiting for me to answer but ushered me into the plane, which, due to my long legs and straight skirt, I found most difficult to manage gracefully. I made a mental note to wear slacks in the future. I curiously looked around at all the knobs, gauges, and such while John expounded on ailerons, elevators, rudder, and flaps. Nodding my head from time to time, I hoped to give the impression that I understood. Oh joy! I was completely mystified, to put it mildly. Even the compass was incomprehensible since I had never had occasion to use one. I wasn't sure whether or not 180 was north or south. I suddenly realized my lack of education on the subject of aeronautics and wondered if I had the brainpower to absorb it. Fortunately John didn't tell me how much there was to absorb. This information came in piecemeal surprises.

Action speaks louder than words. Before I realized it, John had the engine going and was on the radio talking to control tower. After clearance to taxi and above the noise of the engine, he explained to me that "the rudder pedals are used to steer the plane on the ground—left rudder to go left, right rudder to go right." Assuming that I knew left from right, he told me to taxi out. Habit is hard to break and I found it a little irritating trying to steer with my feet rather than with my hands. Over-controlling resulted in some beautiful "S" turns taxiing to the runway. Once there John turned the plane into the wind, pulled this knob and that knob, fumbled over me to pick up the radio mike on my side of the plane, and called the Elmira Control Tower.

"Elmira Tower, Tri-Pacer Five One Delta, ready for takeoff."

The Tower promptly responded, "Tri-Pacer Five One Delta cleared for takeoff."

John quickly maneuvered the plane to the end of the runway.

"O. K., now you just follow the white lines down the center, use your rudder pedals to steer and at the same time push the throttle all the way in," John instructed, pointing again to the throttle handle.

"After seeing my performance taxiing out, this fellow really has nerve," I thought. "Here goes!" I pushed the throttle in, all the way, and we went speeding along, 50, 60, 70 miles per hour. What acceleration! As I was congratulating myself for keeping the plane in a relatively straight line, I heard John say, "All right now, Mrs. Haesloop, pull gently back on the wheel."

"Who? Me?" I shouted above the roar of the engine and a third of the way down the runway. "Are we really going to take off?" This question was totally unnecessary, for that fact was soon quite obvious.

I obeyed his instructions and gingerly pulled back on the wheel. We went zooming up into the air, and looking out the side window, I noticed the ground rapidly pulling farther and farther away as we gained altitude. John was busily scanning the skies ahead while I sat there feeling very important indeed that I had mastered the feat of becoming airborne. "Flying is a cinch," I thought. "Much easier than driving a car." Little did I know that these first lessons are psychologically and physically designed to look easy to spur the (*Continued on page 83*)

INDUSTRIAL GIANT OF THE AIR AGE

PART 1

NORTH AMERICAN AVIATION

by GILL ROBB WILSON

BT-9 trainers were the company's first production aircraft.

Bottom left: James Howard Kindelberger with JN-4 Jenny. *Right:* NA-16 airplane in original configuration as used for the BT-9 trainer competition.

APPROACHING this century, Charles Frederick Kindelberger, an iron moulder of Wheeling, W. Va., married Rose Ann Riddle. In 1895 they had a son, James Howard Kindelberger.

This was the origin of North American Aviation. Nineteen-twenty-eight was merely the incorporation date.

Eastward across the continent from where the jets stream down to Los Angeles International Airport past North American's paneled headquarters, the Ohio River is formed by the confluence of the Allegheny and Monongahela. Sprawling broadly abaft this confluence and down stream some sixty miles from Pittsburgh to Wheeling extends an industrial pattern, an American Ruhr, the steel heart of national security.

And here later, drawn by inexhaustible raw materials for industry, came an immigrant throng, among whom was a freedom-seeking, skilled and industrious cadre from the German metal guilds. In them too pulsed a sense of national destiny. They threw themselves into building a new world as had the settlers before them. They were self-reliant, skilled, hardworking.

James Howard "Dutch" Kindelberger, both in ethnic stock and in environmental influences, is a product of this historic heath. To write of North American without writing of him would be impossible. To write of him without reference to the formative influences of his origin would be to speak of the tree but not of the soil and sun and surroundings which gave it early strength to thrust above the undergrowth and share its acre.

I may speak of those influences as authentically as any. My forebears walked the dark forests with the Riddles. My grandfathers bivouacked by Union campfires and with their German neighbors sang, "Mine eyes have seen the Glory. . . ." The throbbing valley left its mark on a boy. Consciousness of responsibility for the things of God and Country brooded in the public weal. Then, one day, Lincoln Beachey came to the old State Fair Grounds on the Island and flew an exhibition. Here was another frontier! At least three never doubted it—my brother Joe of the Lafayette, "Dutch" Kindelberger, and I. But opportunity had to wait fulfillment.

"Dutch" battled through one and a half years of high school, joined National Tube as an apprentice engineer, qualified in his spare time as a civilian draftsman in the Army Engineering Corps, did a stint in that capacity and then spent eight months at Carnegie Tech, where he was elected president of his class, after which he joined the Engineering Corps again as a civilian.

The following spring the United States entered WW I. A student engineer could have continued his studies but it wasn't that way with "Dutch." He enlisted in the Army Engineer Corps, transferred to the Aviation Section of the Signal Corps, took ground school training at Ohio State, and after Flight Instruction was assigned as flight instructor to old Park Field in Memphis.

After the war, ex-Lieutenant Kindelberger scrounged a draftsman job with the Glenn L. Martin Co. in Cleveland. Anyone who sought a job in aviation in 1919 was either far-sighted or weak-minded. "Dutch" drew $110 a month, not enough to finance a civilian wardrobe for an ex-Jenny jockey who therefore cut the buttons from his uniforms and wore them to work—the uniforms that is, not the buttons. However, there were fringe benefits. Not having to work every night, "Dutch" taught school in the evenings. Free on Saturday afternoons and Sundays, he processed photographic film in the boarding house bath tub; and wrote "you fix it" items for Popular Mechanics. Shortly he advanced to chief draftsman and then to assistant chief engineer.

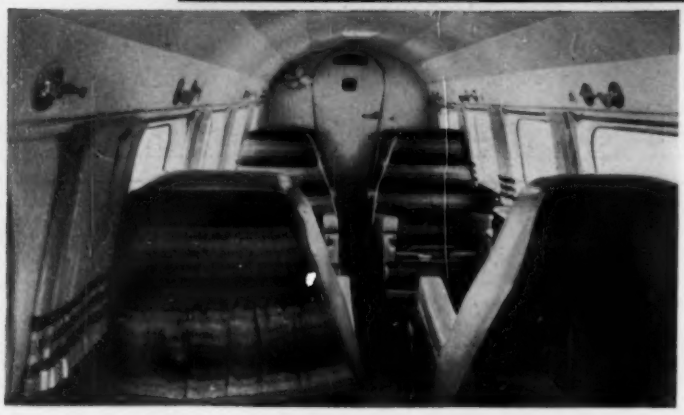
The experience at Martin could not have been duplicated elsewhere. The company had a great reputation and a character to match. Donald Douglas was chief engineer. Larry Bell was factory manager. Glenn Martin had himself come up the hard way. They formed quite a team—Martin, Douglas, Bell and Kindelberger. And they turned out some notable aircraft—the first metal monoplane and the first all-metal seaplane. It was with a Martin Bomber, the MB-2, the first to carry a 2,000-pound bomb, that Bill Mitchell sank the Ostfriesland.

And it was the opportunity of working with Douglas that led to the next chapter in the Kindelberger career.

Douglas was among the very first formally educated aeronautical engineers. After several years at Naval Academy and several more at (*Continued on page 68*)

With a small group of dedicated craftsmen "Dutch" Kindelberger launches an industry

Left: Early view of company plant at Los Angeles International Airport, then Mines Field. *Right:* J. L. Atwood, J. H. Kindelberger, J. S. Smithson.



Left: Leading edge panel gives access to control cables and systems tubing. *Left below:* Cabin in a six-passenger configuration. Aircraft accommodates 11 for airlines. *Below:* The throttle quadrant. Automatic mixture feature eliminates need for mixture control. Manifold pressure also adjusts automatically with a change in altitude.

By GERALD J. SCHLAEGER

PILOT REPORT

DE HAVILLAND DOVE CUSTOM 800

New engine power boosts performance on this versatile British import

NEW DOVE CUSTOM 800 offers increased horsepower, improved takeoff and single-engine performance plus a very plush customized interior. Exhaust augmented, the supercharged, fuel-injected DH Gipsy Queen 70 Mark III engines now develop a full 400 horsepower each. None of their characteristic quiet or smooth running qualities have been sacrificed.

During FLYING's pilot evaluation, which was conducted from LaGuardia Field, New York, the Dove climbed from 10,000 to 10,500 feet on one engine pulling METO (maximum except takeoff) power; density altitude was 11,500, weight 8,150 pounds, and indicated airspeed was 105 mph.

Propellers are three-bladed DeHavilland and full-feathering constant-speed controllable hydromatics geared to reduce tip speed. It is only at high rpm and power that the noise level becomes noticeable—the Dove is one of the most quiet airplanes on the market today. Propellers were formerly reversing, but lack of nosewheel steering in the Dove precluded their licensing in Britain or the United States, and the reversing channel has been blocked off.

As the name implies, the Dove is a custom airplane. It is flown from England via the North Atlantic route to Fort Worth, Texas where an interior, to customer's specifications, is installed by Horton and Horton. Removable bulkheads make the configuration very flexible. A popular arrangement is a six-chair plan where the first four from

Powered by twin fuel-injected engines of 400 hp each, the Dove cruises at 210 mph at 8,000 ft. Range at that altitude with reserve is 1,140 miles.

the flight compartment face rearward and the rear two face forward with folding tables between.

The tables fold outward from the wall and a leaf is available to extend it completely across the cabin if desired. Cushions also can convert four of the chairs into two full length beds. Fabrics throughout are very fine and the floor covering is deep pile wool carpeting.

The lavatory has a chemical toilet styled as an upholstered seat equipped with a magazine holder. A fold-away sink with hot water is provided; water supply is from a two-gallon tank in which a thermostatically controlled immersion heater maintains proper temperature. A drinking water supply is enclosed in a paneled compartment next to the sink.

The Dove has two baggage compartments; one located directly under the flight deck has 22 cubic feet and 300 pounds capacity. The rear, aft of the lavatory, has 45 cubic feet and 600 pounds capacity. In earlier Doves, the auxiliary fuel tank was placed in the rear compartment and was of such shape as to take up baggage space. It is now constructed to form the floor of the compartment, greatly increasing useable space. Its weight and that of the fuel carried of course must be subtracted from the baggage allowance; capacity of the auxiliary tank is 62 gallons.

Seating arrangements are sufficiently flexible that up to 11 passengers may be carried in addition to the crew. This permits the Dove to be operated as a small airliner, and several are.

Superior Airlines of Atlanta, Ga. operates eight Doves in an eight-passenger configuration on their routes from Atlanta, Huntsville, Ala., Memphis, Monroe, La., and New Orleans. Passengers particularly have noted the quietness of the cabin. Bill Walters, Monroe station manager, says the Doves are going out with better than a 50 per cent load factor.

TAG Airlines operates three Doves in nine-passenger configuration between Detroit City Airport and downtown Cleveland. Eight round trips are flown per day and the lines average 3,000 passengers per month. Two pilots are utilized on both lines.

Reading Air Service operates two in 10-passenger configuration for charter.

Basic price of the Dove is $136,000 delivered at Fort Worth. If the custom interior is not desired, $5,000 may be deducted from the basic price; the airplane still would be equipped with six cabin chairs, folding tables, removeable bulkheads and lavatory facilities.

The Dove standard equipment list includes many high-cost items usually carried as extras. A complete anti- and de-icing system as well as the auxiliary fuel tank is included.

Import duty is $11,900 and (*Continued on page 64*)

There is a promised rendezvous
for which my day is done too soon

To wing with them who will in theirs
foregather on the harvest moon,

For I and mine shall nameless pass
as fledglings of the nearer sky

Akin to them who cruise the stars
alone in that we sought to fly;

Yet, vain would be our discontent
and envy foul upon our part

Since we too had the precious gift
of challenge thrust upon our heart.

The fragile wing that lifted first
above Killdevil's drift of sand

Still forged, despite its frailty,
the portals to a promised land!

The first weak engine's stuttered cry
against the Carolina dawn

Still thundered of a universe
where planets spin and comets spawn!

And were these not the goads of God
to spur us in our faded day

If not to reach the harvest moon,
to toil in faith to pave the way.

GILL ROBB WILSON

Step into the miniature world of philately for a new perspective of aviation lore on the fiftieth anniversary of U. S. Air Mail

TEN BILLION PAPER AIRCRAFT

By TOM BURRIER

MAN WITH HIS large wings by beating against the air will be able to dominate it and lift himself above it."

So claimed Leonardo da Vinci, fifteenth century inventor, painter, and all-around genius. And his man-powered glider has flown millions of miles, on air mail stamps of many nations. As do the hopeful creations of Ellehammer, Clement Ader, the Wright brothers and a host of other aerial pioneers.

If it flies now, did fly, will fly, or never got off the ground, chances are it's been immortalized on a postage stamp. Over 10,000 different adhesives directly connected with aviation development: heroes, aircraft, fields, inventions, "firsts," have been issued in the past 50 years. For faithful, detailed fact recording of air activity, no other dozen volumes can compare with a single album of "air" stamps.

Suriname stamp commemorating Shepard rocket flight.

Early airplanes, for example.

Hungary pictured its first heavier-than-air effort on a 1959 air mail stamp, to publicize the Transport Museum in Budapest. Denmark in 1956 commemorated Jacob Christian Hansen Ellehammer's fantastic machine of 50 years before. France honored Clement Ader's "Eole" attempt of 1898, and Mexico pictured a speedy biplane of 1913. These and hundreds of other plane designs are painstakingly researched, cross-checked, screened, before they reach a printing press; a major error in presentation on several million copies could torpedo national dignity or cause international repercussions!

Globe-circling flight of the Russian space man Gagarin.

In aviation's infancy every first crossing of an ocean, sea or channel was a major achievement, the pilot lionized by an adoring public. A dozen nations postally cheered Lindbergh's crossing, including the U. S. with an engraving of the Spirit of St. Louis. Spain not only honored "Carlos" and his (*Continued on page* 88)

(1) Austria, (2) Hungary, (3) U. S. Lindbergh's crossing, (4) Spain honoring Lindbergh, (5) Greece, (6) Russia, (7) Netherlands, (8) Italy honors Leonardo da Vinci, (9) Belgium, (10) Switzerland, (11) Sweden, (12) China 1932 airplane over Great Wall, (13) Paraguay, (14) Mexico, (15) France Mystere IV, (16) Germany, (17) Poland and Sputnik.

SINGLE ENGINE INSTRUMENT TRAINING FOR ARMY PILOTS

Single-engine airplanes and weather mix easily in a civilian program that qualifies Army pilots on instruments

By STEVE RANDALL

LIGHT SINGLE-ENGINE aircraft are proving themselves capable of extended weather operations in a rigorous program of instrument training for Army pilots. Backed by flight training based on the lowest published minimums in the Army Jeppesen flight manual, students conduct actual weather flights in Piper Comanche 250s.

During the past four years, aircraft of the instrument school have logged an amazing 1,900 hours of weather time while piling up a total of over 30,000 hours—without an accident—all accomplished in single-engine airplanes.

Initial pilot training, conducted at Camp Rucker, Ala., now includes instrument training, but a large segment of previously trained Army pilots still lack instrument flight qualifications. Aware that full utilization of their aircraft required IFR flight, the Army established a requirement for a school to bring Army pilots to full instrument certification.

"Train and qualify Army Aviators as fixed-wing instrument pilots in accordance with Federal Aviation Agency standards and applicable Army regulations." This was the mission handed out. Ross Aviation, Inc., with civilian flight operations in Tulsa, Oklahoma was quick to accept the challenge, and the Army Instrument Pilot

Above: Link training. Instructor on the right is acting as approach controller for four trainers; instructor at left works basic instruments with one pilot.

Far left: Ross Army School Comanches form backdrop for, l. to r., Russell Blair, v.p.; Joe Ross, president; and Joe Cannon Ross, v.p. and gen. mgr.

Left: Vice President Russell Blair points up detail of Lycoming 250-hp engine to Army pilot. Engines run 1,100 hours between overhaul without difficulty.

School became a reality. Initially three schools, operated by Ross, conducted instrument training for the Fourth, Fifth, and Sixth Armies. Training has now been centralized at Post Field, Fort Sill, Oklahoma and students come from the entire United States.

Fort Sill was originally built to protect the early settlers from the Indians; today, its officers cast an approving eye on the work done by the nine vari-colored Comanches operated by Ross. The word "Ross" preceeding the aircraft designation number in the Texas-Oklahoma area has earned a mark of respect in instrument flying excellence and traffic control response. Twenty-seven students enter each eight-week class and six classes are conducted each year.

FLYING traveled to Fort Sill to get a first-hand look at the school directed by Russell Blair, Ross vice president. Instrument flying enthusiasm reigns; it is the main topic of every conversation.

When asked if he would be willing to ride in the back seat of an airplane flown in weather by one of his graduates, an instructor replied, "Me, and my family too." Flight and ground school instructors are Airline Transport qualified and average over 8,000 flying hours per instructor; several are over the 10,000-hour mark. Averaging a thousand hours per year, it doesn't take long.

The course is scheduled so that ground school subject content is slightly ahead of synthetic training, which in turn preceeds the flight lessons. The student thus receives nothing in flight about which he has not been briefed, and also has had the necessary practice in the Link trainer.

Ground school lasts for 92 hours. It covers construction and theory of the various instruments and systems plus a broad coverage of techniques and procedures. Link time averages 40 hours. Flight instruction, 70 hours.

A thorough indoctrination in the Comanche is a must; a pilot must know his aircraft if he is to become capable on instruments. He learns systems, power settings, climb schedules, approach speeds, stall and landing characteristics, and all factors involved in proper control—each model airplane has its own peculiarities.

Theory of flight is covered as it pertains to instrument flying: how important are load factors, how do they fit with in-flight turbulence; how can maximum performance be obtained by using the correct angle of attack or pitch attitude?

The pitot system, lifeline of the airspeed indicator, altimeter and vertical speed indicator, is taught.

The gyro system: gimbal rings and erecting mechanisms, precession, its causes and (*Continued on page* 81)

Utah Air National Guard F-86D is used in practice fire and radioactive decontamination drill as part of recovery program at the Provo Airport.

USAF RESERVE KEYS NATIONAL SURVIVAL AND THE CIVIL AIRPORT

By COL. WILLIAM L. KIMBALL, Deputy Chief of Staff, Plans, Continental Air Command

As told to Lou Davis

IF YOU FLY from an airport that has runways longer than 6,000 feet, and if you wake up one morning to find your country involved in a total war, don't be surprised to see your airport suddenly swarming with F-100s and F-105s and B-52s and B-58s. You will find professional military men using your airport as if it were their home station. And you will see civilians in uniform, Air Force Reservists, working around the clock to make it effective in its role as a civilian Air Force base.

For the first time in the history of air warfare, the scene of duty for the American aerial minuteman is in his own backyard. If an attack comes, it must be assumed that it will be suddenly devastating. Should the Soviets unleash nuclear bombs or chemical warfare weapons, our own airborne forces are expected to proceed to Russia and do likewise. When friendly aircraft return to the United States to find their bases blasted and out of commission, they need airbases for landing and servicing for the repeat assault against the enemy.

Here is where the ready-now air reservist comes in. The instant trouble starts, he joins forces with civilian specialists and skills at the local airport to recover homeless bombers and fighters.

An important part of this plan is not to wait until the siren blows to activate and train the units. In order to be effective on D-day, units must be organized and trained right now. They must be ready the instant trouble starts.

The chief administrator of this marriage between civil airmen and air reservists is Lt. Gen. William E. Hall, Commander, Continental Air Command, Robbins Air Force Base, Georgia. (He will be relieved shortly by the now Maj. Gen. Gordon H. Blake.) The bonding agent is a Ready-Now program for recovery of friendly aircraft at emergency fields, once an all-out conflict has begun. The program has been developed by a committee headed by Maj. Gen. Harold R. Maddux, CONAC's vice

commander, responsible for the recovery plan.

The plan is prefaced by Gen. Hall in this way: "It is becoming more and more evident that, as the ability of the Russians to do us harm increases, so does our ability to survive and recover increase in importance as a deterrent factor. By making use of civilian fields and abandoned bases, we immeasurably complicate the Soviet target problem, since we add several hundred widely dispersed targets the enemy must try to hit if he aspires to strike even one. Thus, our sustained deterrent strength is greatly increased. The post-attack recovery mission is a positive role, gaining its greatest value because this role itself is already important as a deterrent factor."

Implementing this plan is the task of Gen. Maddux, who headed a USAF committee to determine how best to use some 30,000 reservists toward this positive effort. This reservoir of manpower represents skills that cover the whole occupational spectrum.

In answering the question, "What skills does the Air Force need?" Gen. Maddux said, "Communications mechanics? Sure. Jet mechanics? Of course. But we also must have cooks, bakers, typists, clerks, persons who can run business machines, radio and telephone operators, bulldozer drivers. We need doctors, lawyers, dentists, taxi drivers, ministers and farmers.

"We'll make use of more policemen and firemen than jet mechanics. In fact, there are very few civilian skills we don't need for this program."

The air reservists must mobilize and train these units now. Their task is that of a diplomat, salesman, planner, scrounger, hand holder. They must "sell" the communities on providing the essentials now—little or none of the money and materials is expected to come from government procurement.

The plan involves the cooperation of a multitude of local groups: Civil Air Patrol, Boy Scouts, Federal Aviation agency, local airport operators, community leaders, air traffic clerks, etc.

If and when the chips are down, and B-52s, B-47s, F-105s, KC-135s or comparable aircraft returning from missions find home bases gone and seek assignments to emergency recovery bases, whatever control that may be left directs them to best available recovery facilities. Such facilities must consist of landing strips having a minimum length of 6,000 feet, parking space for aircraft, emergency repair capability.

The inventory must be so thorough that a 10,000-foot stretch of superhighway may be more valuable than a marginal length runway. From the highway, B-52s and F-105s could take off fully loaded for the return attack.

By the time such aircraft arrive at the base or site, reserve personnel and civilians must be prepared to direct pilots on approach and landing details. Weather landing procedures must be proven. They must have crash and fire fighting crews, decontamination squads, medical units, food and rest areas for crewmen. They must be equipped to provide minor repairs, radio communications and a multitude of other important chores —everything that's essential to getting every man and airplane back into the air en- (*Continued on page 72*)

Left: Provo fire fighting equipment in mock recovery of C-47. *Right:* Maj. Gen. Chester McCarty and Brig. Gen. Joseph Benedict observe operations.

Worcester Municipal Airport tower operator briefs airman in procedures.

AIRWORK

OVERHAUL FROM PISTONS TO TURBINES

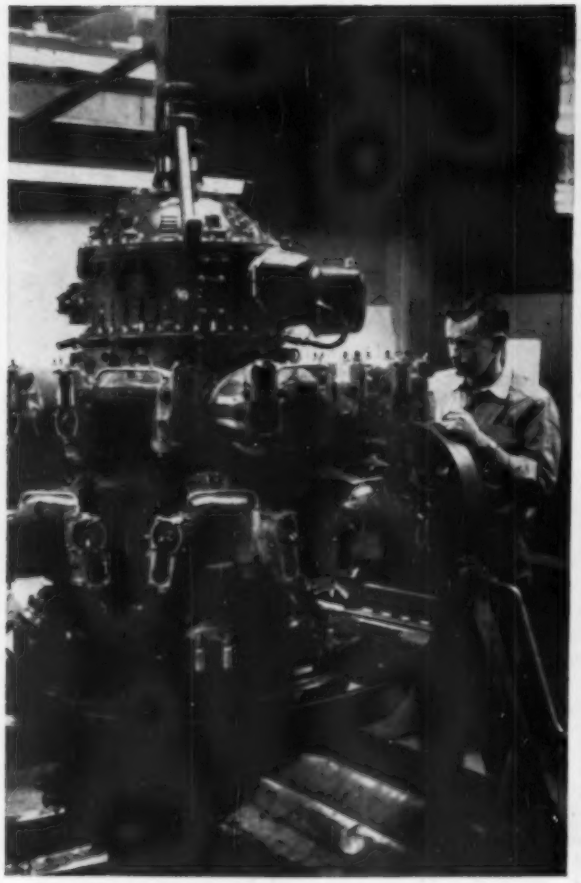
A 225-HP CONTINENTAL Bonanza engine swings by a long chain from the overhead monorail. Near it hangs a 2,400-hp Pratt and Whitney CB16 Convair 440 engine. Halfway down the floor an R1830 Wasp from a Mohawk Airlines DC-3 is being reassembled; to its left two mechanics bolt a fuel control to a 2,185-eshp Rolls-Royce Dart turbine engine.

In the control room of the $750,000 test stand, a test engineer and an Airwork technician monitor a Dart runup. Behind a triple thickness of heavy glass and shielded by 16 inches of reinforced concrete, the engineer writes numbers from gauges into the engine's performance log. The figures he writes during the hour-long runup are distilled into a guarantee that this Dart is performing as it was built to perform, and will operate safely through 1,200 to 3,500 hours; whatever its approved overhaul life.

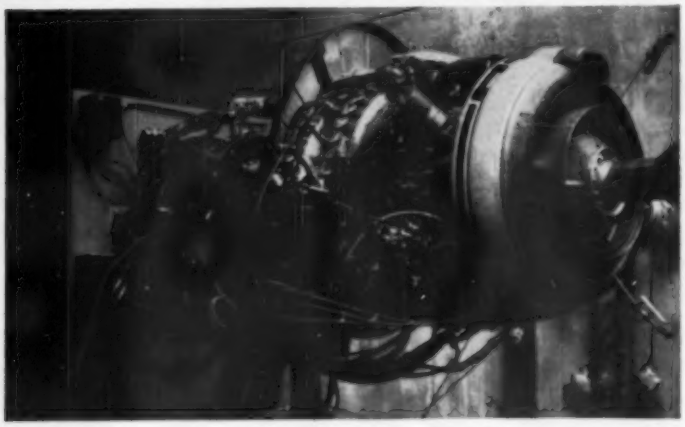
This is the Airwork Corporation. It has been working with engines and airplane operators since November 17, 1946, when a small knot of employees carried job order number one, a single R1830 DC-3 engine, into the snow, bolted it to an A-frame, and began its post-overhaul run-in.

Today, Airwork has some 175 engines in its shops, from the 205-hp Continental, to the 2,400-hp Pratt and Whitney R2800 used on the Douglas DC-6, and the Rolls-Royce Dart turbine from the nacelles of the Grumman Gulfstream, Vickers Viscount, Armstrong-Whitworth Argosy, and Fairchild F-27. Now a distributor for Pratt and Whitney, Rolls-Royce of Canada, Lycoming, Continental, and 22 other manufacturers in the aircraft industry, Airwork employs 304 engine mechanics, working day and night shifts, at its Millville, N.J. plant. Job orders have recently passed the 8,500 mark.

In the beginning, Josiah V. Thompson and his nine co-founders had no assurance that Airwork would turn into a successful operation. They had $80,000, a rented hangar, and an idea. Their money would have purchased more than one surplus two- or four-engine transport airplane, and could have started a small airline, but



Above: Test engineer and Airwork technician monitor Dart runup after overhaul.



Above left: Pratt and Whitney R2800 has final adjustments made as it nears end of overhaul. *Lower right:* Rolls-Royce Dart turbine on dynamometer.

Convinced that quality is the road to success, this company serves some of the world's best-known fleets

By RICHARD BACH

their idea was more far-reaching than that. "Who's going to be handling the engine maintenance and supply problems of the airlines?" Thompson asked.

During the war, the government had taken care of its own airplanes and engines. Now that these airplanes were in civilian paint, there were very few companies concerned with the unglamorous problem of maintenance and support. Thompson sent a letter to airline operators, asking if they would use the services of an organization devoted entirely to engine overhaul and parts supply. Some letters came back. They would.

With the interest of these airlines for encouragement, Thompson and his associates turned the $80,000 into facilities on a former P-47 base at Millville, New Jersey; into tools and parts and paychecks for 24 engine mechanics. The only thing the promising young company lacked was business.

Finally from Trans-Air Incorporated, Airwork found that first R1830 to overhaul. Then from across the river at Newcastle, Del., Trans World Airlines turned over one third of its R2000 DC-4 engines to Airwork for overhaul. From then on, the course that the little company took is the familiar path of a success story. Airwork showed TWA that it would be saving money to have the other two-thirds of its R2000 overhaul done at Millville, and soon 48 of the engines were getting an Airwork guarantee every four months.

In 1949 the company took a step forward when the Nationalist Chinese government received 243 R-2800 engines from the U. S. government and asked Airwork to give each engine a top overhaul and run-in. Airwork had as much business as it could handle; four engine test stands were in continuous use.

Airwork's net sales have been increasing constantly since its first day of operation. Last year the company did $12,447,000 worth of business, with a customer list that includes TWA, Riddle Airlines, Allegheny Airlines, Aerovias, Alcoa, American Can Co., Bendix Corp., Bethlehem Steel, Chrysler Corp., Ford Motor Co., General Electric, General Motors, (*Continued on page* 79)

MEYERS 200B

IN APPEARANCE, the Meyer Aircraft's model 200-B, examined at the company's Tecumseh, Mich. plant, gave an immediate impression of a sturdy, well built, performing airplane. Later, when opportunity presented itself to evaluate the aircraft for FLYING, the impression was fully justified.

As it rests on the wide, tricycle gear, the wingspan of 30 feet six inches appears a bit short (compared to other similar aircraft); however, the area is a generous 161.5 square feet. Inside of each wing is located a main inboard tank (21 gal.) and an outer wing panel auxiliary tank (20 gal.). Total fuel capacity is 82 gallons, of which 78 gallons are useable.

The powerplant under the cowling is a six-cylinder, fuel injection Continental 10470-D rated at 260 hp at 2,625 rpm, turning either a Hartzell or McCauley constant-speed 84-inch propeller, depending upon the customer's choice.

The aircraft is built around a rugged center section of chrome molybdenum steel tubing. The structure is 10.5 feet wide and extends outboard to and including the landing gear attachment points, assuring optimum absorption of landing loads. Wing removal does not involve fuselage structure dismantling.

Other features of construction pointed out by Sales Manager Joe LeFevre included the cabin section, which is also constructed of steel tubing and covered with aluminum skin. All glass and cabin skin are compound curved for streamlining. Aft of the cabin, the fuselage is of monocoque construction. Conventional type control surfaces were chosen for maximum stability and anti-dutch roll characteristics.

The Meyers 200-B has a number of extras as standard equipment. For example: heated pitot tube, 50-amp generator, rotating beacon on tail, ground service plug, vernier engine controls, outside air temperature gauge, shoulder harness, and several other items.

Entry into the wide cabin is through a good-sized door on the right side. It is a short step down into the richly appointed cabin from the wing walk and all four seats are easily accessible. Visibility is excellent from any of the four seats as the Meyers 200-B features "360-degree vision."

The 200-B grosses out to 3,000 pounds, with an empty weight of 1,940 pounds. The useful load is 1,060 pounds and baggage caapcity is 200 pounds. In the front seats, two 170-pound persons will find that there is ample space between the seats; in the back, they will touch shoulders slightly.

Visibility and comfort is excellent when sitting in the front, left seat. If you can swivel your neck around, it is almost possible to see most of the tail through the extra-large side window. The seat is at a comfortable angle and all the controls and switches are within easy reach. The flight instruments are directly in front of the pilot with cowl flap, parking brake and other similar controls at the lower edge of the left panel. Radio equipment is grouped in the center, while immediately below are the throttle, prop pitch control, mixture, gear, flap, rudder and aileron trim.

Near the left wall of the cockpit is the handle for the hand pump supplying emergency hydraulic pressure for extending the landing gear should the engine-driven pump fail. Next to it is a console which groups switches, signal lights and fuel tank selector along with an electrical fuel gauge.

Engine and allied instruments are grouped on the right-hand side of the instrument panel, and space is available for extra radio or additional instruments.

Because of poor weather conditions during the visit to the Meyers factory, I did not get a chance to fly the aircraft at that time. For the evaluation flight, factory manager and Test Pilot Ray Betzoldt flew a Meyer 200-B to Lost Nation Airport (near Cleveland) where we ran most of the checks.

After demonstrating what the Meyer 200-B would do, Betzoldt turned over the left-hand seat to me. In going through the starting procedure it was noted that the Meyers has a few more signal lights to observe and switches to actuate than other aircraft of similar type.

For instance it is impossible to start the engine even with the master *on* unless the landing gear selector handle is in the *down* position. If in the *up* position, a micro-switch opens the starting circuit and prevents the starter from energizing, thus avoiding accidental gear retraction.

Cockpit showing dual controls. Rudder pedals operate steerable nose wheel.

Cabin gives nearly 360-degree visibility, seats four with 200 lbs. baggage.

A four-place executive aircraft that has a range of over a thousand miles in addition to 200 mph cruise speed

By TED DUROSKO

The aircraft is powered by a 260-hp fuel injection Continental.

Also there is an amber light to indicate hydraulic pressure when the gear selector handle is in the *up* position. Another amber light, this one on the instrument panel, glows when the electric auxiliary fuel pump is operating either in the *start* or *on* position. Still another signal lamp lights up red when the fuel pressure drops below four psi. In addition there are the conventional signal lights for the landing gear.

Starting the fuel injection Continental engine follows the normal procedure: the throttle is cracked about one half inch, fuel selector valve placed on either of the main tanks, master switch *on*, electric aux. fuel pump on *start* position, ignition switch on *both* and when the prop has been cleared, the starter button is depressed.

With excellent ground visibility, effective brakes, and steerable nose wheel, the Meyers 200-B is very easy to handle on the ground. However, from a point of personal preference, I might say here that it takes a little more than normal rudder pressure to turn the 6.00 x 6 rugged nose wheel and I like the lighter pressure steering.

Upon reaching the turn-around button on Lost Nation's E-W runway, an engine check was performed consisting of checking mags for even drop at 1,700 rpm (this is the recommended procedure for the 10-470-D engine) cycling the prop at 1,700 rpm, checking cowl flaps (open), setting both aileron and elevator trim for takeoff, glancing over engine instruments and fuel selector valve.

The fuel selector valve is a four-way affair designed by Meyers, and it eliminates (*Continued on page* 60)

Above: Flight line at the Wagon Wheel includes Curtiss SNC-1 prewar trainer, Fairchild 24, two Stearman PT-17s.

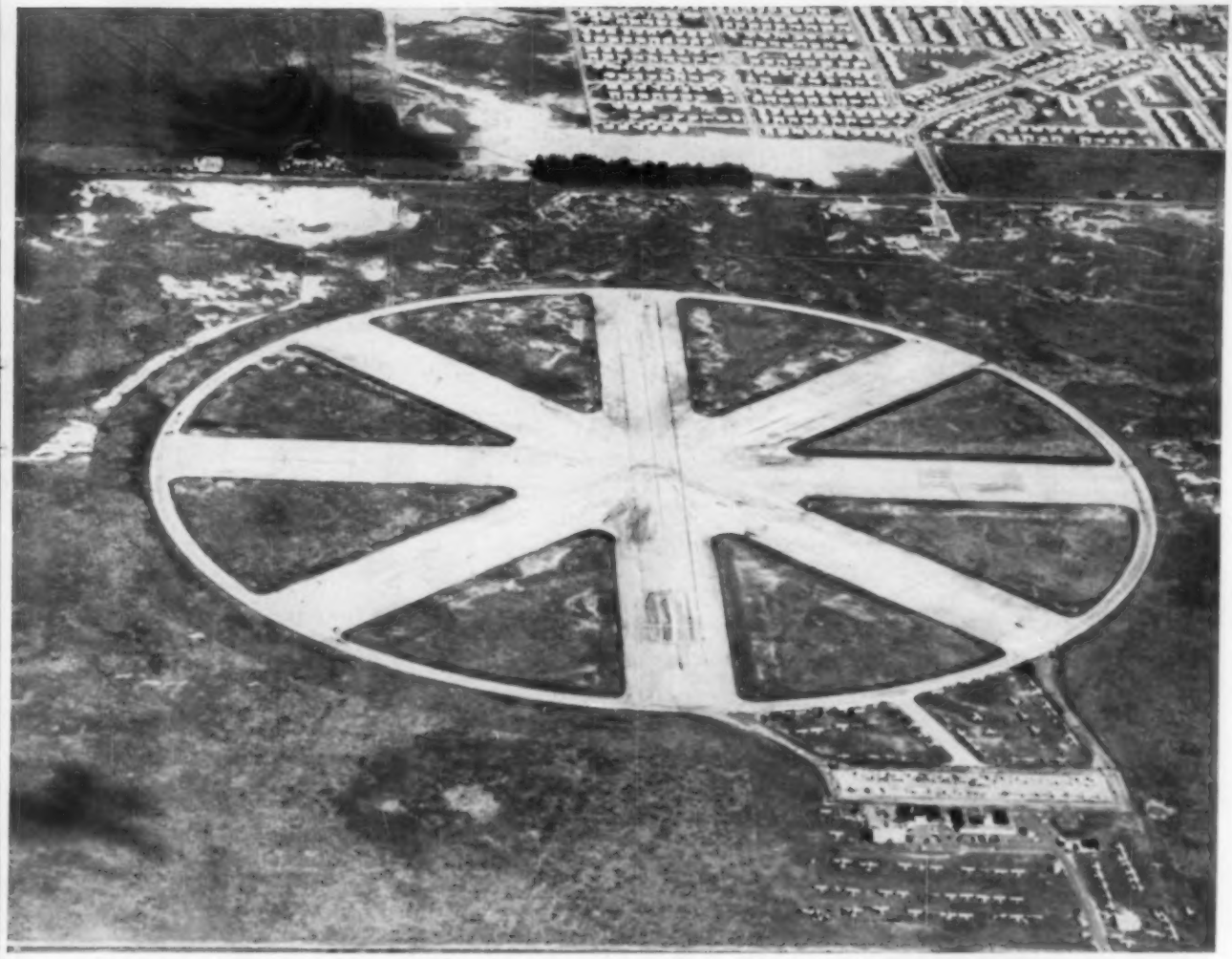
IN HOLLYWOOD, FLORIDA IT'S THE WAGON WHEEL

A well-equipped airport for the private pilot, this facility offers good tiedown in the heart of a famous vacationland

By FRANK MOFFETT

WITH runways on eight equally-spaced headings and a circular perimeter taxiway, Florida's North Perry Airport has come to be known as "The Wagon Wheel." At the unusual field near Hollywood, Florida, 20 miles north of Miami, no landing need be more than 22 degrees out of the wind. Runways are 3,200 feet long and 300 feet wide; all are hard-surfaced and remarkably smooth. Approach zones are clear. Runway 13-31 has threshold and runway lighting; a rotating beacon is on the tower. Lights are on all night.

Managed for the past five years by Dick Baysinger, traffic at North Perry has increased at a steady and consistent rate—approximately 700 movements per month is average. Five years ago there were approximately 25 tiedowns on the field, today there are nearly 200. With no hangars at the present time, tiedown for single engine aircraft costs $10 per month, $15 for a twin. Transient aircraft are charged one dollar per night up to the monthly rate. Operated by Broward County Department of Airports, the mile-square field is leased from the U. S. Navy. Service is good at the Wagon



Twenty miles north of Miami, the Wagon Wheel is home to nearly 200 light aircraft. Runways are 3,200 feet long, 300 feet wide.

Wheel—you drive into the service area as an automobile drives into a service station.

If you desire, you may park your airplane in the tiedown position and service will be dispatched by truck; 80- and 100-octane fuels are available.

A trip among the tiedowns on the field brings back memories—a Waco F-2 in excellent condition stands in the rear of the parking area, a canvas covering its engine and cockpit. Nearby a high-wing monoplane has familiar lines—it is an early model Fairchild 24, two-place and powered by a Warner Scarab 110-hp engine.

Seven flying schools operate at the Wagon Wheel; solo rate for a Piper Cruiser is $7.50 per hour, a Tri-Champ is $10, or a Tri-Pacer, $12. A Cessna 172 can be rented for $15 an hour or you can get twin-engine flying in the form of a UC-78 for $30 per hour. Instructors charge $5 per hour for their services.

The West Hollywood and North Dade Squadrons of the Civil Air Patrol are based at North Perry. Classroom facilities are good; seating is available for approximately 100 persons.

The snack bar is small but service is good and the atmosphere is friendly—a new coffee shop is in the offing with much-needed room.

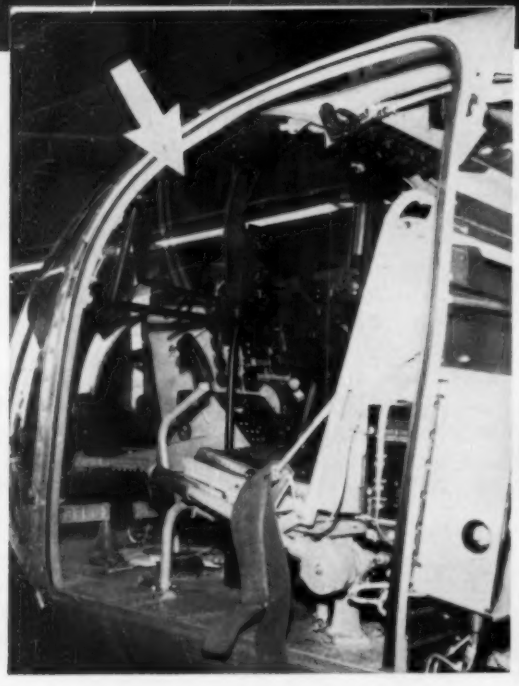
Foam fire equipment is available in the form of a surplus Air Force fire truck, manned by airport personnel.

North Perry has no provisions for IFR traffic but in an area where VFR conditions exist nearly 99 per cent of the time, this presents no problem. If you are entering the area on an IFR flight plan, you can make your letdown at Fort Lauderdale, close your flight plan and fly VFR to Perry .

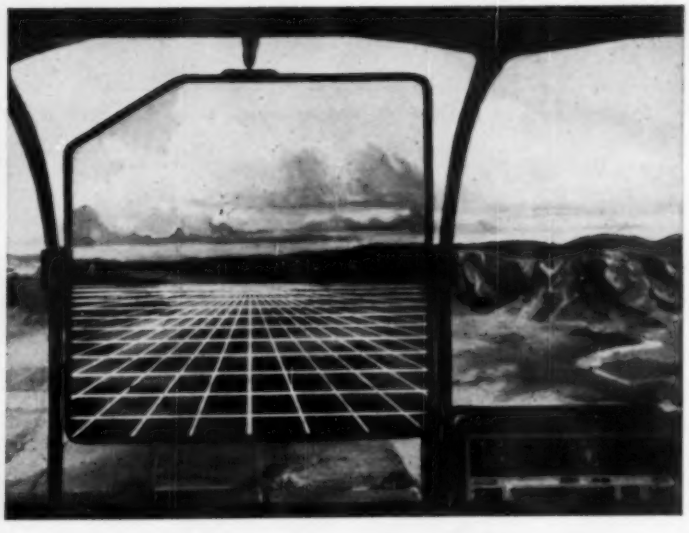
A point of caution to those flying VFR from the north —there is an identical field located some five miles north which is not in operation; it is very easy to land there by mistake. Contact may be made with Perry on standard Unicom frequency 122.8.

Car rentals are available on the field.

The philosophy of service at North Perry is "make it better and make it friendly"; in south Florida it is a good place to land. END



Above: Pilot's-eye view through North American Autonetic projection system showing display image against actual terrain. *Left:* Arrow shows display screen in HTL-7 cockpit. *Below:* Artist's concept of the grid projection.



NEW TECHNIQUES IN

BLIND FLYING for

Pictorial displays and new instruments promise to free rotorcraft from reliance on "hand-me-down" fixed-wing equipment

By A. C. BASS

A NEW DIMENSION in instrument flight is being projected across the pilot's line of sight at the Bell Helicopter Corp., Fort Worth, Texas. It is there that the Army-Navy Instrument Program (ANIP) is undergoing the helicopter phase of its development.

The basic purpose of ANIP is to simplify and improve all-weather flying. When the unique stability characteristics of the helicopter are considered, building a program of this nature is no small task.

While an experienced helicopter pilot with an instrument background may function adequately in cruise under IFR conditions (maintaining balanced flight using needle-ball-airspeed techniques) his other regimes of flight: hover, takeoff and landing, pose new problems. To better understand these problems and how they are being overcome, Flying conducted a study of ANIP at Bell and test flew their dynamic helicopter instrument simulator.

Installed within the cabin of the simulator was ANIP's contact analog display prototype, the North American Autonetics Projector, which can offer the helicopter pilot zero-zero flight capability in an area where weather always has been the limiting factor.

Bell HUI-A Army Iroquois for research has KU land radar on cabin.

Inside the simulator's enclosed cabin the pilot relies solely upon a grid pattern projected across his line of vision to maintain balanced flight. The helicopter's path over the ground and the velocity of movement also are determined by the path of flight over the grid.

The grid then becomes the pilot's "ground" and he sees it as he would in visual flight, since it is projected as a constant image across a portion of the canopy bubble.

A remarkable feature of the display is that during actual contact flight the grid is almost invisible. As visibility decreases, the pattern's clarity increases. In other words, the momentary disorientation while transitioning to instrument flight no longer will be a matter of concern.

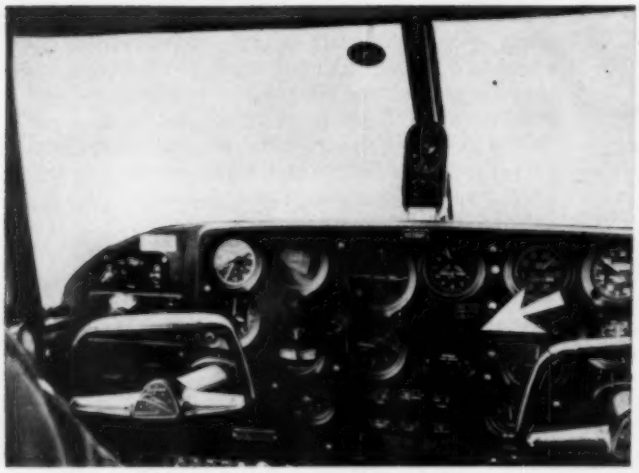
In VFR flight the pilot will look out of the cabin through a spherical section of glass upon which the grid is projected. This allows normal contact until vision is obscured by cloud cover or even bright sunlight. With that background the grid pattern shows up on the glass and becomes the pilot's basic instrument for both coordinated flight and the maintenance of his course.

In the past, improvements on helicopter instrumentation have been minor and, in the main evolutionary. Hand-me-down gyros and gauges developed for fixed-wing use, modified and installed, make up the inadequate panel that now confronts the helicopter pilot, although he is considered on the threshold of an instrument era. Bell and the other companies associated with ANIP chose to break this slow evolutionary process and make a large and significant stride toward a complete, integrated IFR helicopter instrument. Of course this is no overnight proposition, but by 1965 the ANIP engineers and technicians expect to deliver their completed package to the military. Commercial operators can expect to reap the benefits of the program shortly after.

The helicopter VTOL-STOL portion of ANIP originated in 1954 with the active effort beginning in 1955 under the direction of the Army Signal Corps, the Office of Naval Research, the Bureau of Aeronautics, and organizational research responsibility in the hands of the Electronics division of Bell Helicopter. (Paralleling the helicopter portion of ANIP is the fixed-wing program underway at the Douglas Aircraft Company, El Segundo, California.)

The problem of flying the helicopter under instrument conditions always has been the need for ground orientation while in low slow flight or in a hover. The pilot must manipulate four separate controls. Helicopters, for the most part, are dynamically unstable with the motion of one control requiring a compensating motion of the other three. This leaves little time for mental computation of the navigation and flight instruments.

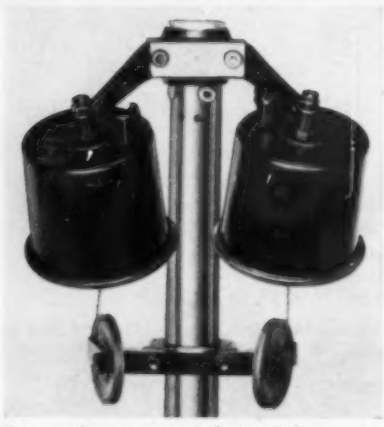
The slower the regime of flight, the more these control forces are compounded and (*Continued on page* 83)



Control unit mounts in standard instrument panel fitting. It contains an independent tumble-free gyro and does not rely on the aircraft DG and horizon.

Aileron actuators used in the Beech Bonanza.

Sensitivity may be adjusted on control unit.



Cessna aileron actuators. System is pneumatic.

BRITTAIN AUTOPILOT

Rudder controls permit coordinated turns with this lightweight two-axis system

By GERALD J. SCHLAEGER

BRITTAIN INDUSTRIES, Inc., of Hawthorne, California now offers a two-axis autopilot featuring coordinated controls. It is priced, for most single-engine airplanes, at less than $900; light twins are slightly higher. The unit's inertial guidance is derived from a self-contained gyro system, thus making it completely independent of the directional gyro and artificial horizon. Control with the autopilot is around the longitudinal and vertical axes.

FLYING's flight evaluation at the Reading, Pa. municipal airport in a Comanche 250 revealed smooth and positive but gentle control. Maximum bank gives a standard three-degree-per-second rate of turn. Lesser rates are at the pilot's discretion, determined by how far he deflects the turn control lever. Controls for the entire system are located on a three and one-eighth inch instrument panel escutcheon. In fact, the entire guidance element is housed in the case of a standard turn-and-bank indicator. The controls consist of an *on-off* push-pull button, a rotating sensitivity button, a thumb-type trim adjusting knob, and a *left-right* turn control lever.

With the increasing interest in instrument and weather flight and new production aircraft propefly equipped and fully capable of flying it, it is inevitable that the new corps of instrument pilots will soon discover just how busy a single pilot can be in instrument flight conditions. It seems as though four hands and two heads should be standard equipment. The autopilot is the answer to the problem.

The high cost and weight penalty of sophisticated course and approach coupler equipped autopilots which were designed to handle transport aircraft has precluded any large scale installations in the smaller airplanes. It is here Brittain finds the market in which they feel their new autopilot will excel.

Well known as producers of auxiliary fuel tip tanks for Navion, Bonanza, and Comanche aircraft, Brittain now drives an entering wedge into the light aircraft autopilot field. Of the many new entrants in this field, the Brittain unit has much to offer in the way of economy, simplicity, and reliability.

Prices range from $895 for aircraft such as the Cessna 182, Navion and Twin Navion, Piper PA 22 series, and Mooney Mark 21 to $1,395 for the twin-engine Beech Travel Air, Cessna 310 and Aero Commander.

Beech Aircraft has an- (*Continued on page* 90)

Even severe impact can be survived with proper safety gear and aircraft design

Protection Against Crash Injury

By JOHN T. FLYNN, M.D.

A MAN FELL 320 feet from the top of a sheer cliff, brushed a small ledge half-way down, and landed on a gravel-strewn beach at a velocity of 65 mph and with a peak deceleration of approximately 200 G. He was unconscious for three days with a fractured skull; within ten days, he had completely recovered from his many lacerations and had no after-effects.

Other human beings have survived unprotected falls of fifty to 150 feet, with impact velocities up to 60 mph and peak decelerations of 140 to 200 G. Often only minor injuries without loss of consciousness occurred, in spite of striking such objects as wooden roofs, two-by-fours, metal T-bars, metal screens, automobile hoods, and skylights.

This remarkable resistance of the human body to abrupt deceleration involves conditions the aeronautical engineer must take into account in designing the crash-injury protective features of an aircraft.

As in the cases mentioned above, the decelerative force against the human body must be well distributed rather than localized. It must be as brief as possible; the objects which are struck by the body must yield under the impact to a suitable extent. Also, the protective devices must operate efficiently along the directions through which the stopping forces are applied; and the aircraft must not disintegrate.

Fortunately for its occupants, the peak decelerations of an aircraft occur within less than a half second after impact, and are completed within that half second. This very brief time interval favors the survival of human tissues, often with only slight injury, under the strain of decelerations of 35 to 40 G, in rearward, frontward, and downward directions.

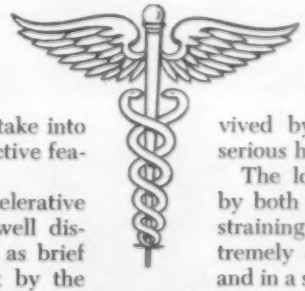
Usually on crash landings or aborted takeoffs, there is more than one point of crash-impact, although the aircraft tends to maintain a straight crash course. It is logical to assume therefore that an aircraft should be strengthened mostly along its fore-aft axis, yet the abrupt forces which arrest the aircraft can act in directions 30 degrees to either side, 15 degrees above, and 45 degrees below this longitudinal axis. In fact, the vertical crash load often exceeds that along the fore-aft axis, as witnessed by the frequency of spinal vertebrae fractures among military jet pilots.

Crash forces acting sideways on an aircraft are usually not great, since they occur toward the end of a crash course. Unfortunately, they often exceed the side-load strength of the aircraft structure, especially when acting at angles more than nine degrees to right or left of the fore-aft axis of the airplane. Also, sideward decelerations of low G may be highly important in the post-stall gyrations of high-performance aircraft, where the pilot's head and helmet are thrown against the canopy because of the lack of sideward restraints. Also, rigid arm rests which do not yield adequately may cause bodily injury.

An aircraft striking the ground at an angle of less than 18 degrees will ricochet, lengthening the distance of deceleration and cutting down the resultant G. Striking at an angle between 18 and 30 degrees will cause severe damage, but the occupants are often uninjured. Angles of impact more than 30 degrees are excessively destructive.

A well executed ditching in calm water with speed and angle of entry kept low, will result in a peak deceleration of less than 10 G, entirely harmless to the well-braced occupants. Most civil transports and most light aircraft can withstand peak decelerations of about 30 G without disintegrating.

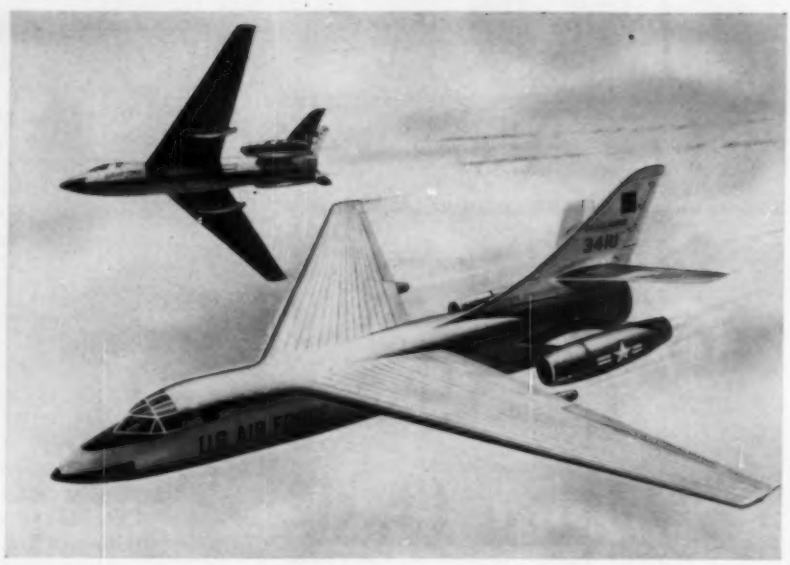
That the proper distribution of crash forces to the least vulnerable portions of the body is essential is illustrated by a large transport aircraft which struck the ground in a nose-down attitude of about 50 degrees, at a speed of 150 mph. Forty-two per cent of the passengers survived; the remainder did not, in almost every instance because of abrupt violent contact of the head with rigid seat supports. The same decelerative force distributed properly over the body was survived by the others, in many instances without serious harm.



The lowly lap belt, so often carelessly ignored by both pilot and passengers, is still the basic restraining device for aircraft occupants, and is extremely effective. It does not cut people in half; and in a study of 704 crash survivors, only 23 showed signs of abdominal injury which could be blamed on the belt. In an average crash with peak deceleration up to 20 G, the properly belted occupant most likely would experience brief pain, minor bruises, and some later muscle soreness.

When the lap belt is used alone, it must be anchored to the basic structure of the aircraft and not merely to the seat frame; it should have a holding capacity of 25 G forward, 10 G upward, and (*Continued on page 77*)

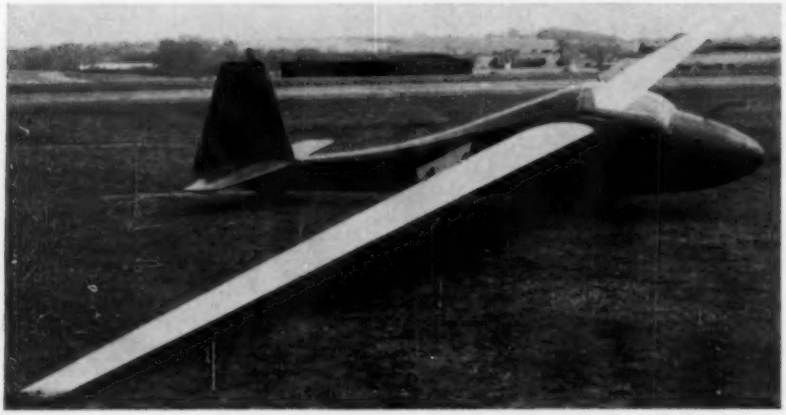
NEWSREEL



SUCTION WING *(Right)*. Two Douglas WB-66 weather reconnaissance bombers have been redesigned by the Northrop Corp. for Laminar Flow Control system which is expected to increase the aircraft's range and payload by as much as 50 per cent. The enlarged wing has a number of slots through which suction turbines suck air, eliminating turbulence usually present beyond the 50 per cent chordline of the wing, thus inducing laminar flow. Two J79 engines have been located at rear fuselage section to permit underwing suction exhaust.

SABRELINER *(Left)*. North American T-39 touches down at the Naval Air Station, Brooklyn, N. Y., after an overseas tour of 12 countries. Return from Spain to New York was made in an elapsed time of nine hours and 39 minutes, with stops at Azores and Argentina. Average speed was 413 mph. Aircraft is powered by two Pratt and Whitney JT12-A-6 engines of 3,000 pounds dry thrust each.

VOLAIR Model 10 *(Right)*. New three-place all-metal personal aircraft manufactured by Volaircraft, Inc. Alliquippa, Pa. Powered by a 135 hp Lycoming engine. FAA certification is expected soon. Four place version planned.



EON 460 *(Left)*. Latest British sailplane by Elliotts Of Newbury, well known manufacturers of motorless aircraft. Design conforms to the Standard Class category, has a wing span of 49.25 feet and is equipped with speed limiting dive brakes. Gross weight is 600 pounds, glide ratio 32:1 at 40 knots. Price is $2,900.

NEWSREEL

BOUNDER *(Right)*. Shown for the first time to the public during July 9th at Moscow's Tushino airport were a number of Soviet's latest production military aircraft. Among them was the Mach 2 Bounder bomber, pictured with two missile-bearing Sukhoi day fighters. Bounder is considerably larger than our B-58 Hustler.

MIL-6 HELICOPTER *(Left)*. Also appearing at the Moscow air show was this huge crane helicopter, shown here carrying what is supposed to be the space vehicle, Vostok, in which Maj. Yuri Gagarin made his orbital flight. Mil-6 is powered by two shaft turbines of 4,650 shp each and is said to lift more than 30,000 lbs.

SIKORSKY S-64 *(Right)*. Artist's conception of the twin-turbine Skycrane now under construction at the company's plant at Stratford, Conn. Rotorcraft will have a gross weight of 38,000 pounds and a useful load of 20,760 pounds. It will be powered by two Pratt & Whitney JFTD12A-2 8,100-shp turbine engines.

SUPER NIKKO *(Left)*. Japanese four-place aircraft, basically a Beechcraft Mentor with modifications in the cabin and engine areas. Manufactured by Fuji Heavy Industries, Ltd., who build T-34 Mentors under agreement with Beechcraft, the Super Nikko is powered by a 340-hp supercharged Lycoming GSO480 engine. The prototype established a new Class C-1c altitude record of 32,536 feet in 1959.

NO. 256

I learned about flying from that!

A military pilot, in the weather with electrical failure, discovers that he is not completely alone

By RICHARD BACH

As an Air Force pilot, just out of Cadet training and gunnery school, I had no use for people who didn't fly airplanes. Tower operators were there to help me get an ATC clearance; when they cleared me onto the runway for takeoff, I'd be sure to look around for myself, not as a double check, but because I just didn't trust their word that the way was clear. Flight maintenance crews were people who left wrenches and screwdrivers in the air intake of the engine and rarely knew much more than I did about repairing an airplane.

The Air Traffic Control system was a stone's throw from worthless and far too wound up in its own little world to realize it. I once waited an hour and a half to be cleared on a 20-minute hop, because someone along the line was confused about ADIZ procedures. At the end of one cross-country, with fuel down to 20 minutes flying time, I had a traffic controller insist on keeping me in the holding pattern so that he could bring in a C-124 who had been waiting to land for 10 minutes. I had to declare an emergency to make him realize that my single turbine just wasn't going to run much longer and that I was not looking forward to a flameout in the weather. I landed with 30 gallons total fuel remaining, enough for another four minutes of flight.

With the exception of some always-sharp GCA units, I felt that I was pretty much on my own from the time I fired up the engine till the time I shut it down. I changed.

The sky as I took off had a high overcast that Weather told me would lower as I neared Riverside, California's March AFB, but that March would be carrying twelve hundred broken by the time I got there. No problem. I was alone in a T-33 jet trainer, and had flown the penetration at March before, so I didn't feel that there would be too much that was unfamiliar for me to do. ATC, for once, was prompt, and my wheels folded into the well five minutes before estimated takeoff time. I turned out the pattern at Stead AFB, Nevada, and flew a standard departure route over Reno.

"Report over Bakersfield to Oakland Center," Reno approach control said. "Have a good trip."

"Wilco and thank you, Reno," I called, and settled into a climb on course.

At 25,000 feet the bottom of the overcast was flicking the top of my canopy, and in a second I was on instruments. The cloud was still thick as I pulled the throttle back to cruise power and leveled at 35,000 feet. Smooth air, easy flying.

Then it started. A red light flashed at the lower right side of the instrument panel, over a placard that said, *inverter out warning*. The inverter supplies all the power to the radio navigation instruments, the heading indicator and the attitude indicator. I'd have a hard time letting down at March without those needles showing me where to go and when to turn in the penetration. Fortunately, the Lockheed people had installed a spare inverter, and I flicked the switch from *main* to *spare*. The light went out. This must be the fifth inverter to go out on this airplane in the last month, I thought. If *I* were a mechanic . . .

The light came on again; the spare inverter had burnt out. I flicked the switch back to *main*, and the light went out for a minute, then flickered on again.

The things are overheating, I said to myself. If I give them a chance to cool, maybe I can make one last long enough to get me far enough through the letdown to break out of the weather. If I could get into the clear, there would be no problem, but here in the weather on instruments and entering the high-density area above Los Angeles, I need inverters.

I turned the inverter switch off and the little *off* alarm flags dropped into place in the omni course indicator and the attitude indicator. This meant flying "partial panel" instruments, something I hadn't done since Primary flight training, a year ago. The low frequency radio compass was useless. I had heard for a long time that the "bird dog" was fine in clear weather, but hopeless in the soup. This was a typical example. Static in the earphones, and no matter how finely I tried to tune it, the needle simply would not point to any radio station. It wandered 50 degrees on either side of the nose, and occasionally even swung around to point behind the tail. I figured that I was still five minutes from Bakersfield, if the winds at altitude were what the weatherman predicted. I flew by the magnetic compass, mounted directly over a placard saying, (*Continued on page* 91)

Powder Puff Derby winner Frances Bera, center, embraces the runner-up team of Aileen Saunders, left, and co-pilot June Douglas, right. Mrs. Bera, a five-time Derby winner, is an instructor for Belmont Aviation, Long Beach. Mrs. Saunders, twice a first place winner, is Hawaiian Tour Conductor for President Airlines. Both are veteran flyers. Both recommend AC Aircraft Spark Plugs as "best for all planes."

AC SPARKS POWDER PUFF DERBY WINNER FOR 6th STRAIGHT YEAR!

No. 2 Plane also equipped with ACs

For the sixth straight year, the first place plane in the Powder Puff Derby was equipped with AC Spark Plugs. This year, Mrs. Frances Bera took the prize with her Beech Bonanza. The second place plane, a Cessna 172 flown by Aileen Saunders, was also equipped with ACs. On this year's route from San Diego to Atlantic City, the contestants encountered some of the most severe conditions ever experienced in Derby competition. Here is proof again that AC Aircraft Spark Plugs give the best performance in all types of aircraft and in all flying conditions. Get them for your plane. Ask for ACtion . . . ask for AC!

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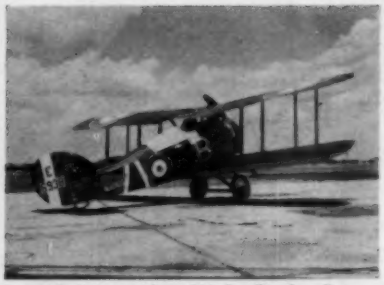
Sopwith Camel flown by owner Frank Tallman of Palos Verdes Estates, Calif. 100 hp LeRhone.

Another WWI fighter owned by Frank Tallman, the German Pfalz DXII. 160 hp Mercedes.



Sopwith Snipe with a 230 hp Bentley Rotary. Owned by Jack Canary of North American.

Eddie Rickenbacker with the Spad XIII, type he flew in WWI. Plane has his squadron insignia.

A U. S. built WWI fighter, the Standard E-1 was loaned to A. F. Museum by Jas. B. Petty.

WORLD WAR I REUNION

To the 338 World War I pilots who saw action over France 43 years ago, the scene at Wright-Patterson AFB, Dayton, Ohio, last June, brought back a flood of memories. Here they saw on display and in action the airplanes they flew and fought with. The occasion was the first World War I Pilot Reunion sponsored by the Air Force Museum. The airplanes were brought to Wright-Patterson by members of Antique Aircraft Association who meticulously restored them to authentic and flyable condition.

Line-up of WWI planes at Wright-Patterson. Foreground is a Bleriot monoplane owned by Cole Palen of Red Hook, N. Y.

Capt. Eddie Rickenbacker, our WWI leading ace, is greeted on arrival by Maj. Robert L. Bryant Jr., Director of the Air Force Museum.

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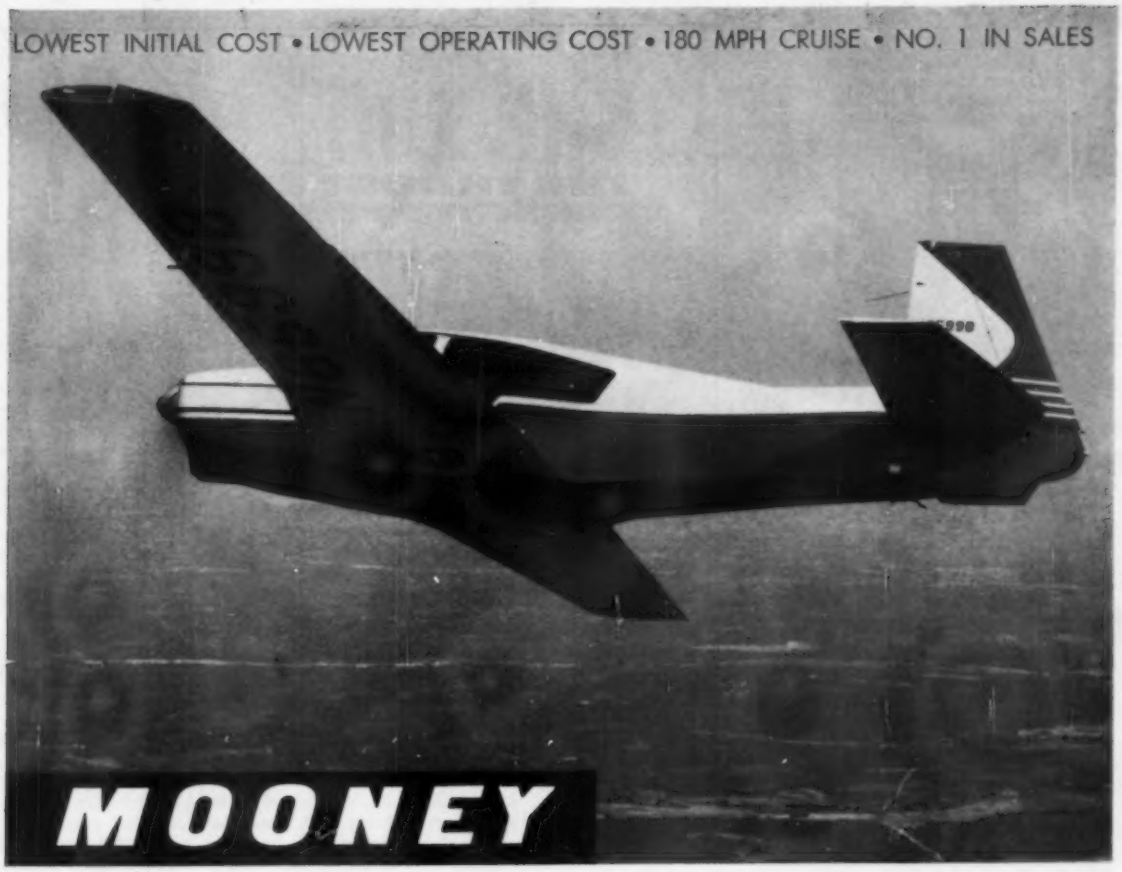

#1

first in June sales for retractables!

OFFICIAL AIRCRAFT SALES (A.I.A.)						
aircraft model*	MOONEY MARK 21	COMANCHE 180	COMANCHE 250	BEECH DEBONAIR	CESSNA 210	BEECH BONANZA
June sales	28	9	24	11	15	25

*listed in order of advertised price

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- ☐ Airframe and Powerplant Technology
- ☐ Aeronautical Engineering Technology

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For other courses, see pages 6 & 78

THE THRUST LEVER

By CAPTAIN DAVE KUHN

THUNDER AND FURY

WITH LITTLE DOUBT, thunderstorms have brought many people to a realization of the Creator. To a pilot, all the terror, helplessness and human frailties may be wrapped up in one big hairy thunderstorm. There have been bales of literature written about these expressions of nature's wrath. There has been nothing written on how to fly through one gracefully.

If we are to believe our weather experts, thunderstorms are capable of developing vertical currents as high as 100 mph.

They can flip an aircraft over. Oftimes comes hail, which may reach a diameter of several inches. Then, of course, there are the attendant icing problems.

The thunderstorms to be most feared are along a weather front. This (for the laymen) is where warm moist air is in contact with colder dry air. The two do not seem to be compatible.

The most vicious thunderstorms in the world are to be found between the Rockies and the Mississippi River.

In recent years there has been some fine work done by the Weather Bureau and the airlines to give more information on the location of thunderstorms. They are called "Black Areas." Periodically, TWA, UAL and other carriers issue broadcasts pinpointing the heavy activity. This is so a pilot may plan his flight around the danger.

Radar reports by the Weather Bureau give the size and intensity as well as location on the "CU" activity.

Most all pilots are familiar with the radar advisory service. Such sites as "Blush First," "Box Ballot," "Sleeper," "Foot Pad" etc., span the nation and will give vectors or steers to any pilot requesting same. Most of the time these gents, despite the trick names, can be a great help in picking soft spots through a front. In recent years airborne weather radar has lessened the hazard.

As one pilot put it, "It has done more for the modern pilot than the Albatross did for the Ancient Mariner." When it's working, it removes the guesswork. We must thank "Pete" Quesada for making it a law on all commercial airliners.

Probably the greatest horror of flying thunderstorms was checked out by the pilots themselves. Military and commercial pilots have conducted research programs by deliberately flying into any and all types. Of course the ships used are beefed up to withstand tremendous gust loads.

Many have come back battered and bent, like the work of a sledge hammer. They also came back with information and proof that flying thunderstorms is more than any airplane should try. I have two good TWA pilot friends who took a sturdy modified B-17 and for over a year played cat and mouse with the worst they could find.

Robert N. Buck, who at age 17 set a transcontinental lightplane record, is one. John Charles ("Speed") Hagins is the other. According to Hagins "Anybody that says they have the news on flying thunderstorms is either a liar or has never been in one." Franklin ("Pappy") Young was the pilot on a DC-3 from Winslow to Burbank. He was letting Hagins hold the wheel while he was figuring his monthly time sheet. Hagins, attempting to do a good job and hold the course, ran into what he thought was a harmless little cloud. There was a decided jolt. "Pappy" grabbed the wheel and after getting in the clear said, "Son, either fly under, over, or around. Don't ever fly through." Captain Young retired from the airline at age 60 but still flies his own plane.

No matter how cautious a pilot is, he will get trapped on occasions. That light spot might be hail, especially if it is greenish in color. That nice hole can close up in a very few minutes. Only experience can tell you that those "post hole diggers" coming out of the bottom of a dark cloud bank are places to avoid.

There is no set pattern in clouds. They can form so fast that no warning can be radioed. Once trapped, there are a few things one can do. Slow down to somewhere between spin-in and cruising speed. The slower the better. Don't fight the controls. You might pull your wings off.

Hold her straight and try to keep from panicking. Prayer may help. Hagins will also confirm that you may expect the full treatment at the freezing level. There is not much of anything you can do for solace.

Without radar vectors, airborne radar, or a clear spot ahead, the one-eighty is a most useful and healthful maneuver to remember. Thunderstorms do not know the difference between a hero and a coward. As far as they are concerned, I am a coward.

Are your spark plugs fouling out?

There are three common causes of aircraft-engine spark-plug fouling. Any of them can cause misfiring, rough running, hard starting or loss of power.

OIL FOULING. Plugs suffering from this condition carry a wet coating on the insulation. If this turns up in plug inspection, it's a tip-off to more serious trouble—oil is getting by the piston rings or intake valves. This may call for a cylinder change or a major overhaul.

LEAD DEPOSITS. All fuel for today's high-performing aircraft piston engines *must* contain tetraethyllead to prevent knock. When the lead has done its job, most of it is changed chemically and blown from the cylinder. No combustion process is perfect, however, and hard, shiny, ball-like deposits can build up on plug electrodes and insulators. Some of these deposits conduct electricity. So, spark gaps are altered or the voltage leaks from the center electrode to the ground electrode through the insulator deposits. The spark doesn't jump the gap and you end up with a Mag. drop and a rough engine.

The cure is simple, though. Make sure you're using the right spark plugs for your particular engine . . . and have them checked regularly.

THE "CIGARETTE." This one is easy to control. The "cigarette" is the white insulator that fits over the ignition lead wire running down to the contact button inside the top of the spark plug. Any dirt or moisture on the cigarette or inside the plug walls can short out the current before it jumps the gap. Keep "cigarettes," leads and plug wells dry and clean.

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Variable Sweep Wing

(Continued from page 23)

research are: a long-range, low-altitude, supersonic attack and air-superiority aircraft for all of the services; and, the supersonic transport that the Federal Aviation Agency is sponsoring. Both of these aircraft have stringent design requirements. They have been and still are the center of heated technical arguments.

However, the favorable position of the variable sweep wing in the fighter contest is shown in a recent statement by the Secretary of Defense Robert S. McNamarra during Congressional testimony. He said, "New developments in engine performance and in aerodynamics, particularly the variable geometry (variable sweep) wing concept evolved by NASA, now make it possible to develop a tactical fighter which can operate from aircraft carriers as well as from much shorter and cruder runways, and yet carry the heavy conventional ordnance loads needed in limited war."

The current desire at the FAA is for the supersonic transport to cruise well above Mach 2 and to land at lower speeds and on shorter runway than current jet transports. Apparently the only way of meeting these specifications is to use variable sweep wings.

If the variable sweep wing is used on these two government sponsored aircraft and it works as well as it has on small models, then it seems certain that this type of wing will become commonplace in aviation. Virtually any airplane, transport, bomber or private aircraft that flies at high subsonic speeds or higher could be improved in overall performance through the use of variable sweep wings. On current designs it is necessary to limit wing sweep to 30 or 35 degrees so that landing and other low-speed characteristics can be kept within allowable limits. On a few aircraft, such as the North American F-100 fighter, the wing sweep has been increased to 45 degrees to lower high speed drag.

To illustrate in detail the advantages of variable sweep it is convenient to compare two hypothetical designs. One is a small, six to eight place, high-speed business aircraft with 35-degree swept back wings. The other is a business aircraft of the same size and type that had variable sweep wings on which the sweep angle could be varied from zero degrees to 60 degrees. While current engineering opinion generally holds the variable sweep wing business aircraft to be feasible, it undoubtedly could not be built for several years—until a background of experience had been gathered on a military aircraft or the supersonic transport. At best the variable sweep private aircraft can be considered the next generation, although one which will offer significant performance improvements.

The variable sweep, high subsonic speed business airplane has five important performance advantages over one with a fixed wing with 35 deg. sweep. These advantages are:

- Higher cruise speed for given power.
- Improved stability and handling characteristics at cruise speed.
- Lower landing speed and shorter landing and takeoff distances.

(Continued on page 58)

6 ways Air Associates makes your flying easier!

1 SEAVIEW INDUSTRIES, INC., MIAMI, FLORIDA builds Revolutionary, New Prefabricated SEAVIEW HANGARS!

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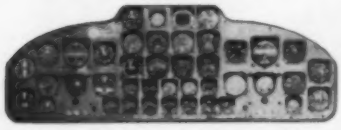

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3 USE OSBORNE Citizens' Band Radio

Communicate from plane-to-office or plane-to-home with Osborne all-transistor "Class D" citizens' band two-way radio. Model 300 (above) is 3.2 watts; comes complete with mike, crystals, and power cord. . . . . **$149.50.** (Portable models also available from **$99.50**)

4 USE AIR ASSOCIATES Seat Belts

These full-bodied nylon-rayon belts exceed FAA requirements. Air Associates has been making seat belts for over 30 years — the airlines choose them . . . they HAVE to be safe.

5 USE A CUSTOM ELECTRONIC Isolation Amplifier

If you have a multi-radio installation, get full use out of it. The 5-switch Panel (right) handles 2 transmitters and 3 receivers, plus ADF. The remote Isolation Amplifier (left) pipes a full 5 watts to your speaker. Prices on Isolation Amplifier from **$73.00**

6 USE BG Pioneer-Leader in Aircraft Spark Plugs

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$.....enclosed (check or money order) including 25¢ per album postage and handling (California residents add 4% State Tax, Canadian residents add $1.00).

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(Continued from page 56)

- Significant reduction in gust loading. Smoother ride on hot summer days at low altitude and in gusty weather. Less airframe fatigue.
- Major improvement in maximum endurance flight time and in performance during air traffic control holds.

Higher cruise speed. The drag rise Mach number is of great concern to the designers of all high subsonic speed airplanes. Often this is called the "force divergence" or "drag divergence" Mach number. These terms all refer to the same phenomenon—the formation of strong shock waves on the aircraft which cause a very rapid rise in drag. In addition to the big drag rise, lift decreases and stability deteriorates.

It is difficult to realize today, but less than 15 years ago this drag rise was such a mystery that many knowledgeable people in aviation believed that it formed a barrier; the "sonic barrier" which would prevent airplanes from flying faster than the speed of sound.

HIGH subsonic speed airplanes cruise at a speed just below the drag rise Mach number. If an attempt is made to cruise above this speed the power required and the fuel consumed rise far too rapidly to justify the increased speed. The most effective means of raising the drag rise Mach number and the cruise speed is to increase wing sweep. A little sweep doesn't do much good. It must be at least 30 degrees to change the drag rise Mach number an appreciable amount.

For instance, a good efficient straight wing will have a drag rise Mach number of about .7, which corresponds to around 500 mph at 30,000 feet. Fifteen degrees of wing sweep will add less than 10 mph to the cruise speed. Thirty degrees of sweep will improve the straight wing cruise speed in the neighborhood of eight or nine per cent and bring it up close to 550 mph. However, a 45-degree sweep on the wings will increase the straight wing speed by 20 per cent, and a 60-degree sweep will increase it about 40 per cent. Therefore, the aircraft with the variable sweep wing could cruise economically somewhere between 150 and 200 mph faster than conventional aircraft with the fixed 35-degree wing sweep.

Improved Stability. Sweepback not only delays the drag rise Mach number; it also reduces the strength of the shock waves that form on the airplane. In turn, the sudden shift of shock wave patterns on the wing, the fuselage and the horizontal tail, which cause most of the stability troubles at these speeds, are eased. As a result it is easier to preserve the stability and maneuverability of the variable sweep wing aircraft at cruise speed.

Better Landing Characteristics. High subsonic speed aircraft with 35-degree sweep all land at 130 mph or better. Under the best conditions they require about a mile of runway. If the gross weight and the wing area are kept constant, there are only two ways to lower landing speed. One, the wing's lifting efficiency or lift coefficient may be increased. Second, the wing span, or its aspect ratio may be increased. The aspect ratio is equal to the span divided by the chord of the aircraft wing.

On the variable sweep wing airplane both the wing span and the lift coefficient are increased by bringing the wing forward to zero sweep. When the wing is forward, its aspect ratio is roughly twice that of a wing with the same size and shape and 35-degree sweep. The lift coefficient of the straight wing also is substantially higher. It is reasonable to expect that the landing speed for the variable sweep aircraft can be brought down to 80 or 90 mph.

Reduction in Gust Loading. Gust loading is a major concern on all high-speed aircraft, especially when they come down to lower altitudes into dense air without slowing down.

The magnitude of the "bump" or load that a gust imparts to an airplane depends primarily on its wing sweep. Straight wings generate a large amount of lift per degree increase in angle of attack.

A wing with 60-degree sweep is about half as sensitive to gusts as a straight wing and about 30 per cent less sensitive than one with 35-degree sweep.

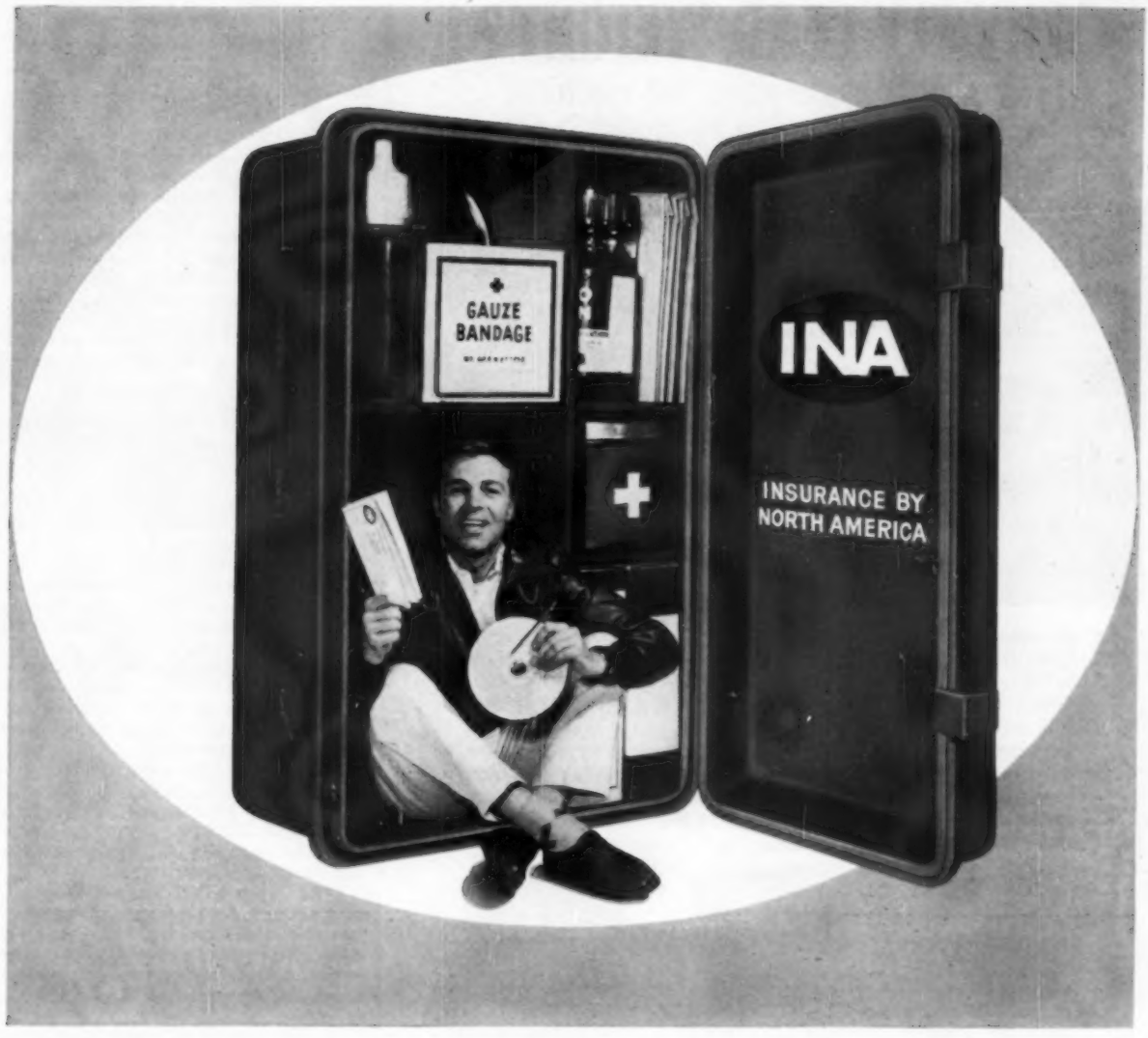
Improvement in Endurance. Slow-speed endurance flight, sometimes required in emergencies and during flights under air traffic control can be increased significantly through the use of the variable sweep wing. Under these conditions the wing is swept forward to lengthen its span, its aspect ratio and its low-speed efficiency. The endurance of the straight wing aircraft should be at least 25 per cent higher than that of an airplane with 35-degree sweep, assuming the same powerplants.

Two questions are usually asked by those becoming familiar with variable sweep wings. One concerns the weight of the variable sweep mechanism. Apparently most airframe experts believe that the weight of the mechanism will be about one or two per cent of the total structural weight of the airplane. This sort of penalty can be absorbed quite readily to get the benefits of variable sweep.

THE other question concerns the problem of landing if the wing sticks in the rearward position at the 60-degree sweep angle. Most designers believe that the chance of any failure of the sweep mechanism could be kept to an infinitesimally low possibility. The two wing panels could be geared together so that one would not move unless the other moved an equal amount. In addition the force required to change the wing sweep angle would be relatively low if the airplane were held in a nose high attitude. Therefore a hand crank could be provided for the crew to sweep the wings forward manually if the power actuator failed.

In the event the hand crank failed, it still would be possible to land the aircraft with the wings swept back to 60 degrees. Even though the landing speed would be up over 150 mph, the elevators would provide adequate control.

Flight tests of an aircraft with the new type variable sweep wing are about four years away according to present plans. The Defense Department is due to select a contractor to design and build its variable sweep fighter in about six months. First flight of that airplane should then occur within three and a half years. END



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Meyers 200-B

(Continued from page 41)

the worry of overflowing fuel tanks, a problem associated with fuel injection engines. In the Meyers design, excess fuel pumped to the engine is returned to the tank being drawn upon, regardless of whether it is one of the main or auxiliary tanks.

As we taxied onto the active runway, flaps were lowered by moving the airfoil-shaped control knob to the takeoff mark on the panel. Automatically the flaps lowered 20 degrees by hydraulic pressure and stopped at the proper position. This feature, which will be appreciated by the night-flying or IFR pilot, is accomplished by a special hydro-servo valve designed by Meyers.

Then it was just a matter of squaring with the runway, feeding in the throttle, holding the nose wheel on the ground (this places the wings at the best angle for rapid acceleration) until the airspeed reaches 70 mph, and then applying some back pressure on the control wheel—the Meyers 200-B lifts off and is airborne in about 750 feet.

Best rate-of-climb speed is at 111 mph indicated (at sea level) and the 200-B goes skyward at about 1,350 fpm; at 120 mph, the rate-of-climb is a respectable 1,250 fpm.

Though we were not loaded to full gross, we found that at 6,750 feet of altitude (the closest we could get to the optimum altitude of 7,500 feet because of a solid overcast) and a power setting of 75 per cent (24 inches mp, 2,400 rpm) the indicated airspeed was 176. With an outside air temperature of 60 degrees F., the airspeed trued out to 200 mph. Factory figures report a true airspeed of 204 mph at 7,500 feet (with gross load).

Using 75 per cent power and at the optimum altitude of 7,500 feet, maximum range (no wind, no reserve) is a shade over 1,000 miles. At 10,000 feet and with a power setting of 60 per cent power, the maximum range can be stretched to about 1,380 miles.

To determine the full throttle speed, we let down out over Lake Erie and leveled off at 300 feet above the water. At an altitude of 872 feet above sea level (elevation of Lake Erie is 572 feet) and with an outside air temperature of 85 degrees F., the Meyers 200-B steadied on 196 mph indicated.

In both the full throttle run, and the climb to altitude for the true airspeed run, the cylinder head temperature stayed in the green, even though the outside air temperature at ground level was in the high 80 degrees F. Apparently the flow of air over the engine is very adequate.

On the other end of the speed range, we checked the slow-flight characteristics. In a clean configuration (gear and flaps up) there was full control at 70 mph; with flaps and gear down, the airspeed was reduced to 60 mph and again the control was very good.

Stalls, with power off, occur close to 67 mph with gear and flaps up; in the landing configuration with gear extended and full 40 degrees of flap, the stalling speed is near 54 mph.

In level cruise, anywhere within the

(Continued on page 62)

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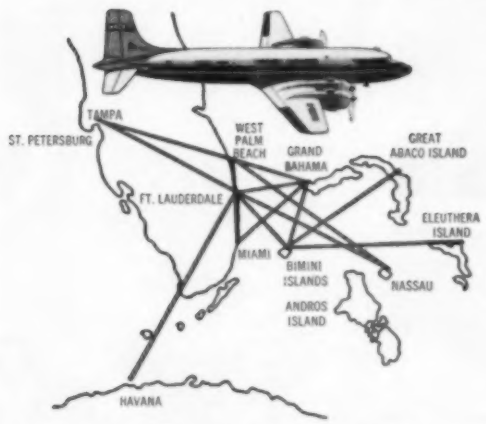
Mackey's new general aviation service ramp, north end of Broward County International Airport, Ft. Lauderdale. Other facilities (office, lounges, weather and briefing room, etc.) are behind service hangar.



The sunshine routes of Mackey Airlines. A perfect safety record, courteous service, comfortable seats, and reasonable fares. For full enjoyment of tropical and island scenery, all flights are scheduled during daylight hours.

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On the ramp, too, everything is first class—24-hour service, modern refueling trucks, ADI cart—and dependable Phillips *66* Aviation Gasoline (80, 100, and 115 octane) and Turbine Fuel. Routine maintenance by A&P's or IA's is available right at the ramp . . . major jobs at the airline maintenance hangar nearby. Mackey also provides multi-engine charter by ATR pilots . . . and, of course, scheduled airline flights in Florida and to the Bahamas.

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Mackey's executive conference room is available to all its customers—an exclusive facility that executive and business fliers should find especially convenient.

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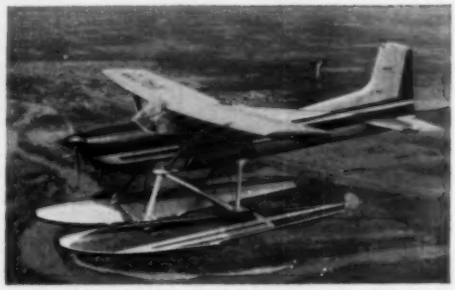

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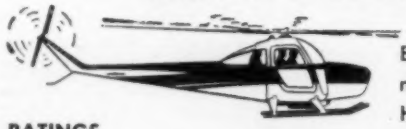

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(Continued from page 60)

speed range from 80 to 200 mph, the Meyers 200-B flies well and has good directional and horizontal stability. It can be flown by trim tabs only (aileron and elevator) and is quite stable, even in light to moderate turbulence. At 2,500 feet, with a power setting of 23½ inches mp, 2,200 rpm, and mixture cranked back to 60 percent, the Meyers trimmed up hands off and indicated 170 mph; at 45 per cent, it indicated 163 mph. In airspeed limits, the green arc (normal operating speed) is from 77 to 210 mph; the yellow arc (smooth air only) is from 210 to 236 mph; and the red line speed is 236 mph.

When landing the 200-B, the semi-Fowler track guided flaps are very effective in controlling the angle of descent. On the downwind leg, the airplane is slowed below 125 mph by reducing power and then the gear is extended. Just before turning on base, power can be further reduced, flaps lowered (any speed under 125 mph) to the 20 degree position, and elevator trim rolled in to hold 80 mph in a normal glide. On the final approach, flaps are lowered to full down, the nose is lowered to maintain the 80 mph, and the flare-out is made close to the runway. If the 80 mph glide is held until the flare-out, the aircraft will settle gently through the ground cushion onto the main gear.

Specifications:

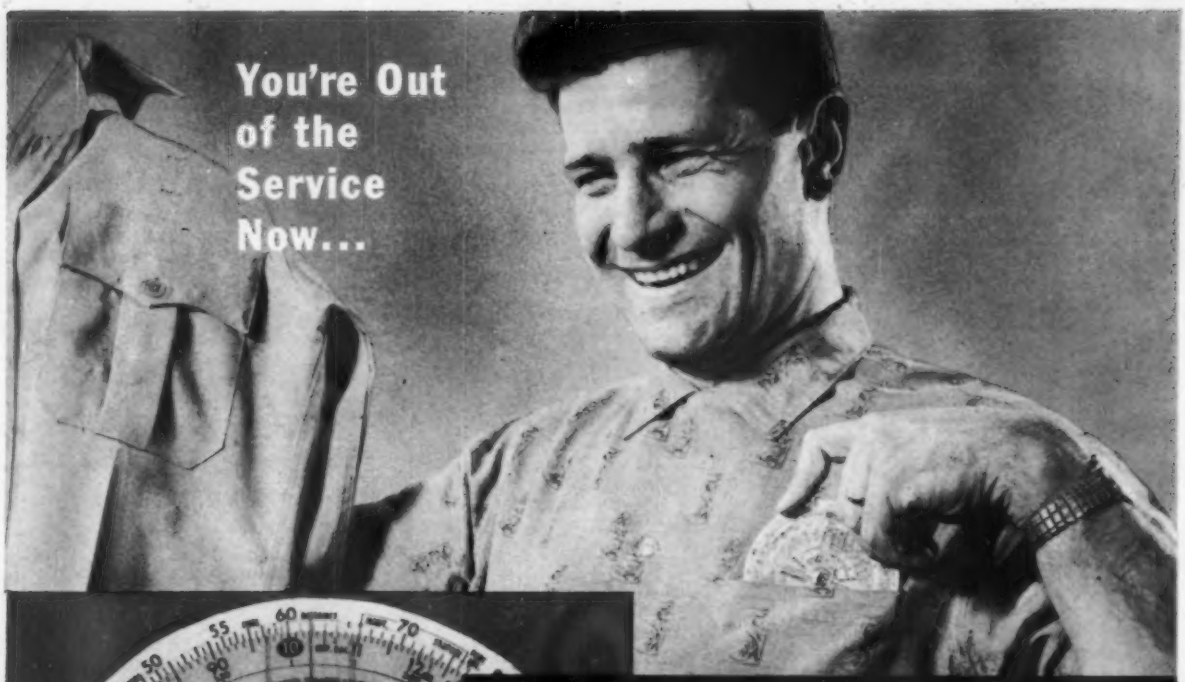
Engine: Continental 10 470-D, 260 hp @ 2625 rpm	
Wing span	30.6 ft.
Length	24.3 ft.
Height	7.3 ft.
Wing area	161.5 sq. ft.
Wing loading	18.75 lbs./sq. ft.
Power loading	11.54 lbs./hp.
Empty weight	1,940 lbs.
Useful load	1,060 lbs.
Gross weight	3,000 lbs.
Fuel cap.	82 gals.
Baggage cap.	200 lbs.

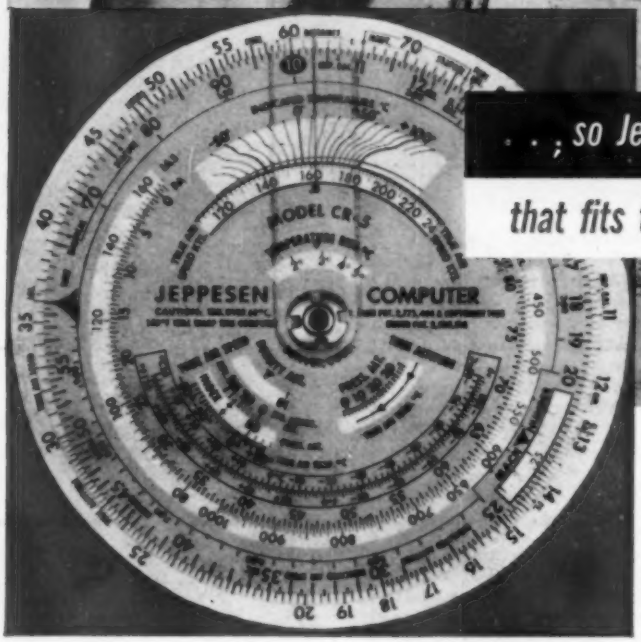
Performance:

Stall speed, gear and flaps up	67 mph
Stall speed, gear and flaps down	54 mph
Cruise speed 75% hp. 7,500 ft.	204 mph
Range, 60% hp. 10,000 ft.	1,380 mi.
Rate-of-climb	1,350 fpm
Takeoff over 50 ft. obstacle	1,550 ft.
Landing over 50 ft. obstacle	1,150 ft.

The selling price of the Meyers 200-B is $24,640. When queried on production, Joe LeFevre commented that presently they are turning out one unit every 30 or 40 days. Delivery of a 200-B can be expected between 30 to 60 days after an order has been placed. Meyers is tooling up to produce four units per month within the next year, LeFevre said.

Inquiries concerning the Meyers 200-B can be directed to the factory or to the dealers at Atlanta, Baton Rouge, Miami, Milwaukee or Houston. END





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Dove Custom 800

(Continued from page 31)

ferry costs from England $4,200. Delivery price with complete electronics would run around $175,000. Radar is available.

The Dove is not delicate as its appearance would suggest for it has a positive ultimate load factor of 5.06 and negative of 3.00. While thunderstorm flying is not recommended, it is comforting to know that if you are inadvertantly caught in one, your aircraft has sufficient structural integrity to withstand it.

The anti-/de-icing system is unique; porous metal strips are imbedded in the leading edge of the wings and tail group. An alcohol jelly is pumped at the rate of two to three gallons per hour. This oozes out through the pores of the metal and coats the leading edges with the solution, to which ice will not stick. If already formed, the alcohol will melt the ice from beneath and allow it to blow off with the slipstream. The system is licensed as an anti- and de-icer. If takeoff is to be made into known icing conditions, it is better, according to David Quinn, DeHavilland Sales Manager, to turn on the alcohol before flight and let the wing get good and wet before starting the roll. In flight, the alcohol is used intermittently.

Propeller anti-icer is of the conventional slinger type and the windshield is de-iced by an alcohol spray.

A 4.8-gallon alcohol supply tank is standard, and a 10-gallon supply tank is optional for $295 extra.

A single windshield wiper is located in front of the pilot. It is electro-hydraulically powered, and the blade has a small roller on each end to relieve the tension load; this is common British practice.

A swing-out stairway provides easy entrance through the very adequate door. The plushness of the interior is apparent as you walk through the passenger compartment to reach the flight deck—and flight deck it is, for it is over a foot higher than the cabin floor.

The pilot's compartment is comfortable and adaquately roomy once you are in, but getting in takes some doing.

The location of the radio controls is excellent, at the top of the instrument panel, where you hardly have to raise your eyes to tune them from either seat. G-APYE had Dare equipment which functioned faultlessly during the flight.

Dual instrumentation is provided and is of British manufacture. They have conventional presentation although the attitude indicator uses a hole to denote the nose of the miniature airplane where United States manufactured instruments use a dot; it seemed a little more difficult to manage small pitch corrections.

The brakes are operated by air pressure; it is a common 600-psi system which furnishes power to operate the landing gear and flaps but reduced to 250 pounds for brake operation. Brake pressure is applied by depressing a lever on the left control wheel; differential braking is accomplished by depressing the appropriate rudder pedal.

The landing gear retracts in from four to five seconds and extends in three to four. The nose gear retracts aft into the fuselage and the main gear outward into the wing.

Starting procedure is simple: fuel valves and master switch on, pre-prime until starter button on right panel lights, depress starter for several blades with throttle cracked one fourth to one third, ignition switches on and continue to turn engines with starters and prime as necessary until the engine starts.

Cockpit visibility is outstanding; both propellers and wings can be seen from either seat. Taxiing is accomplished with the throttles in idle at 700 to 1,000 rpm. There is soft hissing as the brakes are applied—no grabbing, or squealing.

During our evaluation flight the temperature was 64 degrees F, and wind NNW at seven knots. Propellers are checked for decrease and feather at 1,600 rpm. Feathering is accomplished by moving prop controls in full aft position and is powered by oil pressure. If the oil supply has been depleted, two emergency feather buttons on the panel will feather them. Magneto check is at field barometric pressure and 2,500 rpm; the 100-rpm allowable drop was not experienced.

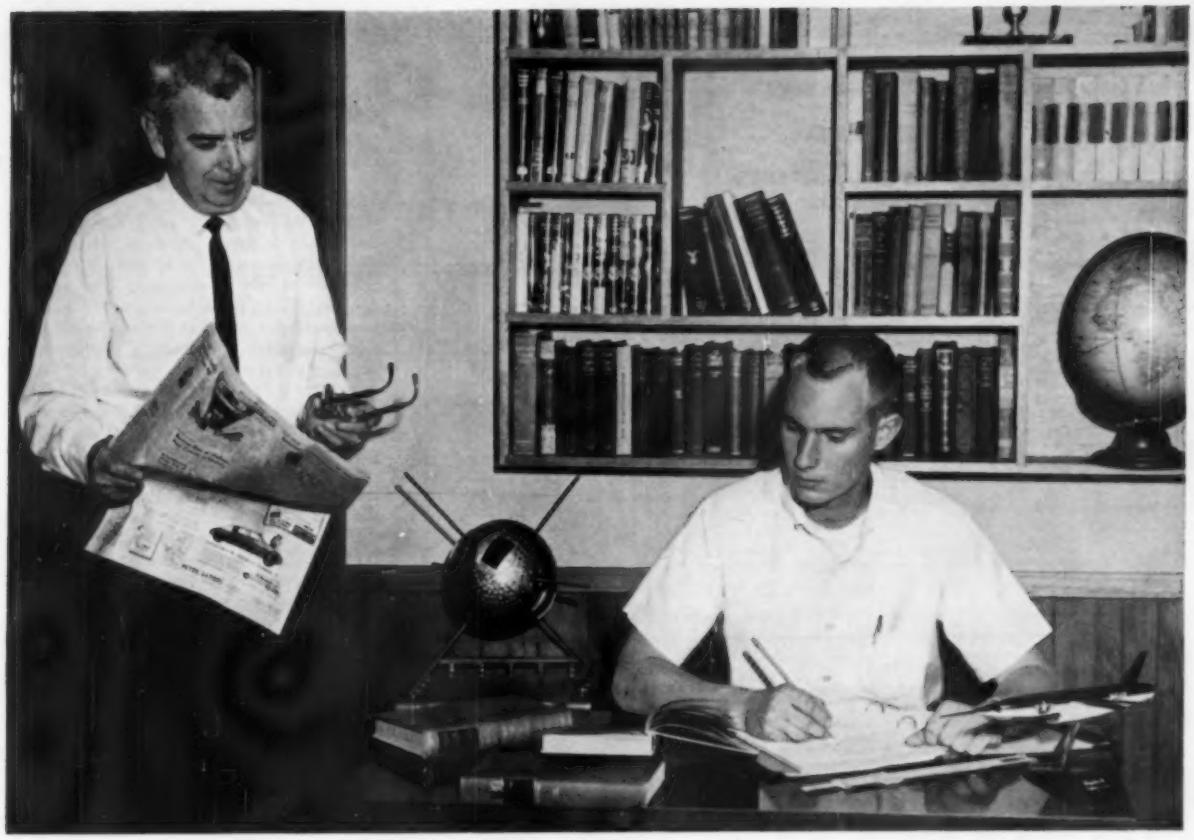
DOVE CUSTOM 800

Performance:	
Maximum speed (sea level)	222 mph
Vne speed (max. never exceed)	237 mph
Cruising speed:	
Maximum (8,000 ft.)	210 mph
Economy (10,000 ft.)	182 mph
Range (max. with 45-min. reserve)	1,447 mi.
Service ceiling (8,950 lbs. gross wt.)	21,900 ft.
One engine	7,700 ft.
Stall speed	
Gear-flaps up	94.5 mph
Gear-flaps down	75 mph
Max. rate of climb sea level:	
Two engines	1,135 fpm
One engine	295 fpm
Takeoff distance over 50 ft.	1,750 ft.
Landing distance over 50 ft.	1,800 ft.
Specifications:	
Wing span	57 ft.
Wing area	335 sq. ft.
Length	39 ft. 3 in.
Height	13 ft. 4 in.
Cabin:	
Length	12 ft. 3 in.
Width	4 ft. 6 in.
Height	5 ft. 3 in.
Gross weight	8,950 lbs.
Useful load	3,005 lbs.
Wing loading gross wt.	26.7 lb/sq. ft.
Power loading	11.2 lb/hp

Forty-seven inches mp and 3,000 rpm accelerated the Dove rapidly to V2 (takoff climb speed) of 97 mph, gear was up at 105 mph. This is the best single engine climb speed. METO power is 42 inches mp and 2,800 rpm.

Climb power of 36 inches mp and 2,600 rpm resulted in an 800-fpm rate of climb at 140 mph indicated. Normally on a cold day this will produce a 500 fpm rate at 150 mph or 140 mph on a hot day. At 10,000

(Continued on page 66)



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(Continued from page 64)

feet the Dove was still climbing at 750 fpm at 140 mph, with 33.5 inches mp and 2,500 rpm.

Manifold pressure is automatically maintained as the altitude increases. This feature is well known to the WWII P-51 pilots, for the same type control was on that airplane. The throttle lever is not connected to the butterfly valve of the carburetor directly, but rather is routed through a barometric wafer which expands as the altitude increases, thereby increasing the throttle opening. Even here, however, the connection is not direct but is through an oil pressure controlled vane which regulates the position not unlike the manner of power steering.

The butterfly valve is oil heated as is the incoming air; thus intake icing cannot become a problem.

Mixture is also automatically controlled; there is, in fact, no mixture control—if the gas is on, it will run. On the throttle quadrant, the areas are marked: rich in the extreme low power area, lean in the cruising power area and rich in the high power area. There is little cause to ever have to cruise the Dove in the high power area as sea level position of the throttle is maintained through all altitudes within the normal range of the airplane.

The Dove was checked in various cruise settings recommended by the company charts with the following results.

Per cent Power	Altitude	Flt. Test by Flying	Fuel Cons.
46	5,000 ft.	170 mph true	29.6 gal
46	10,000 ft.	178 " "	29.6 "
50	5,000 ft.	178 " "	32.1 "
50	10,000 ft.	183 " "	32.1 "
53	5,000 ft.	186 " "	34.5 "
53	10,000 ft.	190 " "	34.5 "
57	5,000 ft.	191 " "	37. "
57	10,000 ft.	200 " "	37. "
62	5,000 ft.	195 " "	39.5 "
62	10,000 ft.	205 " "	39.5 "
66	8,000 ft.	210 " "	42.7 "

According to Quinn the Dove is able to maintain the above airspeeds on less fuel than claimed. He sites a 71 per cent power cruise using 34 inches mp and 2,400 rpm with a true airspeed of 200 mph using approximately 39 gallons per hour. The figures claimed by DeHavilland are guaranteed within a plus or minus three per cent, and according to our figuring it met this in every case.

The Dove is extremely pleasant to fly; the low noise level and almost complete lack of vibration coupled with light controls and excellent stability make very precise control quite easy. Two ILS approaches were flown and no trouble was experience in maintaining the correct heading or the desired vertical speed. It seems to want to sit right there and hold what it has, but a touch of controls and trim will quickly establish a new attitude and new heading. One minus feature was the lack of aileron trim. This is ground adjustable only; we did, however, get along quite well without it.

Stalls are mild, the clean stall occurs at about 95 mph with minimum power settings, at about 11 inches mp. Putting the flaps full down reduces the stall to less

(Continued on page 68)

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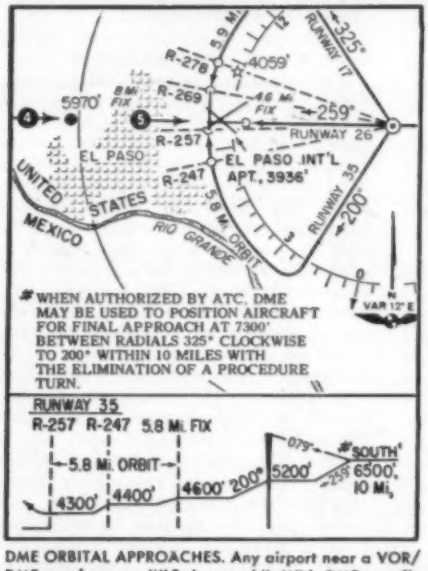

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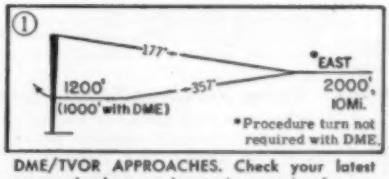

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(Continued from page 66)

than 80 mph indicated. Here again the stall was mild, although there was a little more rolling apparent. Recovery was immediate as the back pressure was released.

Landing the Dove is like falling off a log —you wonder if a bad landing can be made. One point we found is that you use only the 20 degrees of flaps until you are in very close as the full 60 degrees slows the airplane considerably, and you are likely to need power to reach the field.

The initial appearance of the Dove in the United States was around 1952. It was well received but had certain shortcomings which kept it from wide acceptance. There always seemed to be a pool of oil under each engine. At that time DeHavilland built their engines around the principle of mated surfaces; this apparently did not work and the engines are now gasketed and should remain very dry.

The first airplanes had 345-hp engines and while cruise performance was quite good, takeoff and single engine performance left much to be desired. Horsepower in the Mark II engines was later increased to 380, which did much to improve the condition; now with 20 more horsepower added to each engine, performance is right up with the best on the market.

Engine life on the Mark II engines was 1,000 hours and while the Mark III is now scheduled for 800 hours there is every reason to believe it will be extended to the 1,000-hour mark.

The Custom 800 is a highly satisfactory airplane for business requiring aircraft in its class. The first one sold is going to Norton Grinding Company of Worcester, Mass. It will have complete electronics including AVQ-50 RCA radar and a Starflite I series radio package from Aircraft Radio Corporation. The radar installation on it requires the relocation of the air bottles from the nose to allow for antenna placement.

Dealer organization of the Dove is very informal due to the very slender margin under which the company must operate to be competitive. Over $500,000 worth of spare parts are maintained at the New York facility. These are shipped to where they are needed. In addition, Dallas Aero Service maintains a stock of over $150,000 of parts in its warehouses. A resident technical representative is at Dallas. END

North American Aviation

(Continued from page 29)

M.I.T., he had joined Martin in Los Angeles as chief engineer, resigned to become chief civilian aeronautical engineer of the Army Signal Corps, rejoined Martin from 1917-1921 and then returned west to found the Douglas Company, predecessor of Douglas Aircraft. Kindelberger was invited to join him but neither had enough money to pay the fare. In 1925 he was again invited and this time he managed to finance his own trip. "Dutch" went to Douglas as chief engineer and began a fruitful decade of preparation to head his own company. Within three years he was vice-president of Douglas in charge of engineering, in which slot he remained until 1934.

Those were years of great import to airpower. Government had taken cognizance of aviation's potential. The air-cooled radial engine had arrived. Monoplane design had triumphed. Metal construction had won out over wood and fabric. Instrumentation had come into focus. The atmosphere at Douglas was dynamic.

During Kindelberger's years there, the engineering staff grew from seven to more than 400. Seventy aircraft models were produced. Names flick through my mind . . . the Dolphin; the O2H; the BT-2; the 0-38; the TBD and, of course, fabled above all, the DC-1, 2 and 3.

Now that we have glimpsed the preparation of the man for his opportunity, let us see how the opportunity was prepared for the man.

By the latter half of the 1920's, not only had aviation made some solid technical advances, but the national economy was at flood tide. Risk capital was available. The result was inevitable. Aviation manufacturing concerns sprang up by the score. The Lindbergh flight in 1927 and the many ventures of like vein which followed fanned the flames of enthusiasm.

Of course, anyone who paused to think, would realize that such multiplicity of industrial organizations must soon wither without commensurate research and development.

However, there was present in the situation an element of financial solidarity. By 1928, the so-called "golden year," big money and top financiers came on the scene. A number of extensive holding companies were formed. They made acquisitions of those smaller companies whose prospects seemed to them to be brightest. They formed management patterns to cover the entire spectrum of aviation enterprise—aircraft and engine manufacture, commercial airlines, instrument companies—even airports and flying schools.

North American came into being in 1928 as one of these holding companies.

The automotive industry had from the beginning kept a weather eye on aviation. Most big companies had participated to some extent in production of planes or engines for WW I, but nothing very exciting had carried forward from this participation.

The late romancing of aviation had jolted them a little. Maybe there would be, after all, a market to sustain a volume of handmade aircraft for some time to come. General Motors, in 1930, formed a subsidiary, General Aviation Corp., to acquire and operate Fokker Aircraft, a top outfit whose planes were writing much of the exploration history and were in airline use.

Soon however the frost was on the aviation pumpkin—depression and preoccupation with automobiles.

General Aviation was therefore, sold to North American and merged by North American with another acquisition, Berliner-Joyce. The merged operation was based at Baltimore. The big holding companies were by no means in desperate circumstances. The depression was bound to pass and in the meantime, they could ride along at reduced speed in control of the whole ball of wax. They were like the well-heeled man in a poker game. They could copper all the bets and wait for the

(Continued on page 70)

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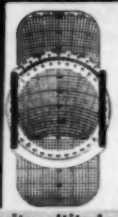

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(Continued from page 68)

breaks. What they couldn't anticipate was that the house would suddenly change the rules of the game. And that's what happened.

In 1934, the National Administration rocked them with the Air Mail Act, which forbade corporations to retain interest in aviation manufacture jointly with airline holdings.

This was a crusher. As a holding company, North American was forced to divest itself of either its airline, or manufacturing projects. The Board of Directors, of which Ernest Breech was Chairman, figured the angles, found the greater advantage lay in disposal of the airlines and other holdings and North American was reduced to an industrial remnant in Baltimore.

Now, the job of Breech et al was to find someone who could capitalize on the remnant. And who better than Kindelberger, number two man at Douglas, seasoned in experience, proven ability and ripe for leadership.

Thus were the man and his opportunity brought together. In July, 1934, "Dutch" resigned the security and prestige of Douglas and headed for the old Caproni-Curtis hangar in Maryland, taking with him as practical and moral support his chief engineer, Lee Atwood, and a project engineer, "Stan" Smithson.

When this trio walked into the eastern setup they must have wondered if ambition had betrayed them. There were no orders in the house; no new designs on the drafting boards; no research in progress.

However, Kindelberger found one unexpected resource: It was the character of his employees—predominantly Hollanders and Germans, many of whom Tony Fokker had brought to the United States. No better aircraftsmen lived—experienced; skilled; industrious.

I've never seen the point in print, so will note here the incalculable debt American aviation owes to the immigrant citizen, a debt of skill but no less a debt of character and loyalty.

PRIOR to WW I, Europe outran the United States in aeronautical interest. War forged this interest into an industry in Europe, a big industry. Thousands of fine craftsmen were trained in Germany, France, Britain, Italy and Russia. And none was better than those who manned the Fokker enterprises.

"Dutch" Kindelberger found one little concentration of it but it also broadly multiplied through our industry.

Kindelberger's "find" wasn't long in demonstrating its value. The Army Air Corps had announced a competition for a new basic trainer. It seemed too late for North American to play any part—less than three months—but "Dutch" bounced his Board of Directors for $36,000 of development money, and told his crew of what was at stake. Several weeks later he realized progress on the NA-16 was far ahead of schedule—a fact unaccounted for by the work sheets and payrolls. Investigation disclosed that his men were sneaking back to the plant at night.

The NRA (National Recovery Act) had decreed a 40-hour maximum work week and was policing it with fervor. "You'll land me in the hoosegow," moaned "Dutch" to his employees.

"But Dutch," they protested, "we aren't working overtime. The payroll doesn't say so, does it? We're just having fun and there's no law against that, is there?"

The NA-16 was completed in nine weeks and flown to Dayton for the competition which it won, thereupon receiving Air Corps designation, BT-9. An initial production order for 42 aircraft was given North American. Subsequent adaptations of the BT-9 saw it used for primary training, ground attack, division observation and even as a utility fighter. It was butter on the bread for a long time.

HIS decade at Santa Monica following the years at Cleveland gave Kindelberger a chance to study desirable location for aircraft manufacture. Many had studied it before him—Glenn Curtis, Don Douglas, Larry Bell, Bob Gross, Claude Ryan and others. Southern California had the call. Outdoor working conditions, heating economies, ample opportunity for expansion, living conditions attractive to labor, good flying weather—these advantages could not be gainsaid. Additionally, there was no unique reason why North American should not move—reasons such as did exist for certain other manufacturers. And if the move was to be made it had best be done while North American was still small and mobile enough to be redomiciled.

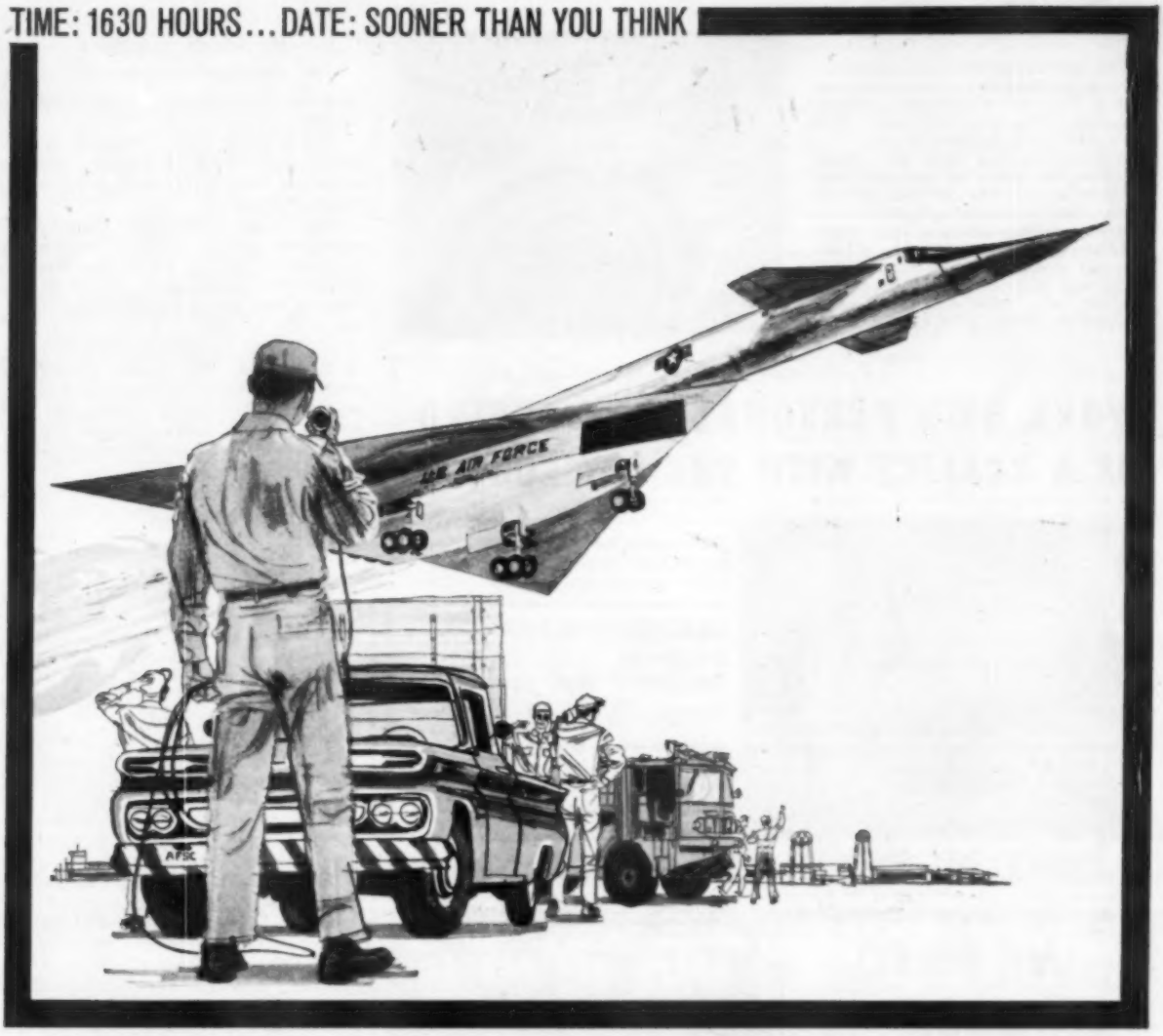
"Dutch" put the proposition up to the Board of North American and was given the green light if he could finance the move without crippling the company. The B-9 production order took care of that contingency. Kindelberger headed for Los Angeles where he leased for $600 annually a 20-acre tract bordering the new municipal airport. The rent was low, but the airport had more open space than anything else. I visited it as a WPA Airport Consultant with Corrington Gill, Col. Sumpter Smith, Lester Gardiner, and several others. Prevailing criticism was "Why so much land for one White Elephant?" Needless to say, Kindelberger was a leading advocate of expansion—landing aids; runways; lighting and sundry other benefits. I'll bet today he wishes he had bought all the farms between downtown and Inglewood. He estimated recently that had he at the time so invested the total capital of North American, which was less than enough to buy a DC-8 or a 707, the company would be worth more money after taxes than it is today.

But, a man hasn't time for everything. Designing and building the modern plant on his 20-acre plot was all-absorbing in 1935. The company moved during January 1936, and within 30 days, the first production B-9 rolled off the line. The original work force totaled 250. Some 75-80 of his men accompanied "Dutch" from Maryland. It was a great personal tribute. Most of his immigrant boys thought California was the jumping-off place.

And we might feel a twinge of sympathy for them did we not know in hindsight that they and "the Boss" and North American were on their way to glory.

What it took to get there and how they managed it is another story to be unfolded in next month's issue of FLYING.

TIME: 1630 HOURS... DATE: SOONER THAN YOU THINK



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The exact takeoff date of the B-70 is still to be determined, of course. But right now the men who will be part of the team that will send it aloft, pilot it and navigate its first flight are preparing themselves for that important day. In the Air Force, the B-70 represents but one technological breakthrough. Other programs, other urgent needs also require the services of young men like yourself. Here may be your chance to be trained to become a highly skilled ground specialist.

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National Survival

(Continued from page 37)

route to a base which can fully service the aircraft.

This is a tall order. It could call for development of skill in handling sensitive armament including nuclear packages and chemical weapons.

The recovery plan is the brainchild of a reservist, Lt. Col. Clinton V. Murdock of Pocatello, Idaho, whose idea was first submitted to Headquarters, USAF Reserve Forces Group, in a detailed letter during the spring of 1957.

Ready-Now forces were originally set up in seven sites, each located in different areas of the nation, to gain experience in organizing and training. Starting last July, CONAC began working toward the ultimate goal of 82 Recovery groups and 200 Recovery squadrons.

The seven groups activated in September, last year, were located in Utah, Louisiana, Pennsylvania, Iowa, Kentucky, South Carolina and Massachusetts.

More than 30,000 Air Force reservists now in Ready-Status will be directed into the recovery mission. They are being assigned according to proximity to home and emergency air base locations. Skills and talents not present in this group will be drawn from inactive reservists and from non-reserve civilian ranks.

Generals Hall and Maddux are extremely pleased with the manner in which the program has taken hold among reservists. Worcester, Massachusetts, serves as a good example of how the program works, how the philosophy is applied in a practical and successful manner.

The 8301st AFRR Group was activated last September 1st. It is composed of six squadrons of which the 9000th Sqdn. is headquartered at Worcester Municipal Airport. Other squadrons are 9201st ARS at Gardner; 9225th ARS at Webster; 9227th ARS at Worcester; 9284 and 9285th at Fitchburg.

Planned strength for each squadron calls for approximately 37 officers and 149 enlisted men. The Worcester-based 9000th unit is about 90 per cent manned.

Since the first training session started, the weekend of October 8th and 9th, 1960, the Group formerly commanded by Brig. Gen. Joseph T. Benedict—Lt. Col. Thomas J. McGrath, is senior USAF representative—undertook an inventory of all airport capabilities in the area; runway length, ability to support heavy high-performance bombers, fighters, tankers and transports; weather and instrument flight equipment and facilities; suitability of aircraft parking space and arrangements; adequacy of refueling system, fire fighting installation and equipment; operational strength of Civil Air Patrol and radio communications network; and the potential capability of civil aircraft owners and operators.

In addition to Worcester Municipal airport investigations, reservists were asked to study Massachusetts' super parkways for straight strips of 9,000 to 10,000 feet in length which could be used for emergency landing and takeoff of B-52s and similar equipment.

Search and survey teams already have joined civil airport management in recom-

mending runway improvements and the installation of additional instrument landing systems.

Part of the operating problem faced immediately was the lack of supplies and equipment needed to set up an operational "shop." Westover AFB was named as the USAF support center; however, it could offer little or no assistance by way of materials and equipment.

"Operation Scrounge" was the answer to the advertised and expected lack of USAF base support. Group and squadron personnel set up a systematic search through all military bases and all services. The program proved fruitful and well worth the effort. Fire extinguishers, rope, cable, chains, chairs, tools and telecommunications equipment was obtained from decommissioned carriers. Office supplies and furniture were obtained from inactive reserve units.

Clothes, such as jackets for line personnel, proved more difficult to come by. Troops worked well into the winter without jackets. On-duty feeding through contract with a local restaurant required considerable negotiations with city airport and restaurant management before meals were obtained at $1 a head.

In addition to primary duty work, training programs include firing on the range, on-the-job study of secondary duties, general training and practice in first aid and security.

Worcester reservists in conjunction with civilian agencies have tackled the huge job of cataloguing civilian equipment which has an M-Day value. They are assigning spray trucks to decontamination units, commercial fuel trucks to aircraft servicing teams, floral delivery wagons to medical units as ambulances; highway bulldozers, graders, scrapers, etc., to crash removal and bomb damage control squads; emergency generators and lighting equipment to base power units.

Every effort is being made to weld local CAP, HAM and civil radio operators, hospital and medical groups into the overall effort. Ready cooperation and support is reported, thus far. But, more time and hard work is necessary before units will be "On-the-Ready."

From the standpoint of civil aviation's stake in this program, prospects are that CONAC's effort will help produce valuable benefits to the fixed base operator.

FIRST of all, the chances are good that the local operator is an air veteran, member of Civil Air Patrol or a long-time member of the inactive reserve. Therefore, he has more than a working knowledge of the problem involved—a good place to begin!

Secondly, wherever local airports selected for Ready-Now recovery service need runways extended or other facility modifications, such improvements "sold" to the community are bound to plow back advantages to the civil operator.

Thirdly, and most important: The single most vital mission of the reservists before success can be achieved is in the realm of public relations and community air education. This effort alone is guaranteed to stimulate public awareness of aviation and its place in the pattern for national and local survival. It is bound to create new interest and new business.

This new M-Day program augments CONAC's traditional USAF air combat and logistics support operations. It now maintains 15 wings and 45 squadrons of troop carrier units, five air rescue squadrons, 13 navigational training units. Other reserve organizations include six Air Reserve Regions, 16 Air Reserve Sectors which supervise hundreds of associated units, 24 Airways and Air Communications Service units, and 24 Medical Units.

For all practical purposes CONAC-USAF recovery units are modern minutemen, but they bear little resemblance to their historic predecessors. Today, the mission is not to run and meet the enemy eyeball-to-eyeball in combat, but to fight him on a different, less direct basis by providing havens for "homeless" combat aircraft and their crews; by manning the re-strike pads so essential to gaining and sustaining strategic advantage.

Gen. Hall believes that this plan is in keeping with our own American way of helping ourselves to combat aggression—to keep U. S. forces strong and victorious even though we elect to take the first blow.

Certainly, the civilian airmen find their peacetime and wartime missions integrated with the reservists. In building a strong recovery capability, peacetime benefits to the local community are bound to be well worth the effort. They may well mean our ultimate survival. END

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Convair 990

(Continued from page 25)

(640 mph. true air speed) at 14,000 feet.

Perhaps the quickest way to give you a pilot's feel for the 990 is to take you along on a more-or-less routine test flight (that is, if there is such a thing as a "routine" test flight).

From the moment you step into the front office of this bird you feel at home. Your attention is focused immediately on the increased, built-in, forward visibility. The desirability of this feature cannot be overemphasized during the present "see-and-be-seen" era. To protect this asset, the standby compass is retracted out of sight, yet readily available for that one-time emergency if it ever develops. Windshield wipers have been replaced by an invisible jet of air supplied from engine compressor bleed. No more need a pilot's head wag as he tries to follow the limited visibility behind the blade during a landing in a dense downpour. During our equivalent icing tests of the Convair 880 jet transport in Alaska, two inches of ice were allowed to build up on the windshield, then removed by use of bleed air. This is backup insurance. Normally, the NESA glass heating anti-ices the windshield.

A pilot glancing around the flight deck quickly surmises that human factor considerations coupled with veteran pilot inputs dictated the location of controls, switches, instruments and alerting systems ensuring basic flight safety. For example: similar to the latest military aircraft, an amber master caution light on the pilot's instrument panel signals the pilot if fuel boost pumps, air conditioning units, hydraulic pumps, generators or other systems, malfunction. The pilot can turn immediately to the systems panel, check which unit is the culprit and take remedial action.

Our flight plan on this particular hop called for evaluation of the aircraft's stability and control about all axes at 15,000 feet. Takeoff weight was 205,000 pounds.

THE flight started at Lindbergh Field, San Diego's Municipal Airport, which is adjacent to the General Dynamics/Convair plant where the 990 is in production. The altitude is sea level. Weather was clear with a runway temperature of 64 degrees F. Wind was seven knots west southwest.

After engine start and taxi to the end of the runway, takeoff power was set by advancing the power levers to the required engine pressure ratio (the minimum was 1.97 for this flight), and checking minimum aft fan speed (93.2 per cent for the conditions noted here). The General Electric CJ-805-23 aft fan engines on the 990 provide 60 per cent of takeoff power with the basic gas generator and 40 per cent by the fan's propulsion of by-pass air.

With brake release the airplane accelerated swiftly to rotation speed. V_R was 133 knots indicated on this flight with an initial climbout speed (V_R + 10 knots) of 163 knots. Time from brake release to lift off was 32 seconds. After normal cleanup of the aircraft for climbout, power was reduced to 97 per cent rpm. Climbout speed was 343 knots calibrated, and we reached cruise altitude (for this flight) of 15,000 feet in four minutes.

This put us in flight test area 2 off the Southern California Coast and in position to accomplish the flight test plan.

A series of pilot qualitative checks were performed and data was taken both on tape recorders and photo panels. The control system was evaluated for stick force per g at both forward and aft centers of gravity.

Following satisfactory conclusion of the evaluation, we made a simulated ILS approach back to Lindbergh Field. Aircraft handling characteristics were evaluated in both the approach and landing configurations. On final with 50 degrees wing flap, speed was 124 knots over the fence (which is 1.3 times stall speed). Landing weight was 140,000 pounds.

After touchdown all spoilers were extended and thrust reversers were used down to 60 knots, in addition to brakes. The aircraft decelerated rapidly to normal taxi speed. Landing roll was 3,300 feet.

Good harmony of the primary flight controls has been achieved by tailoring the "breakout" and control operating forces. A full power, hydraulically operated rudder control system ensures an immediate directional aircraft response with low pedal force.

The apparent absence of ailerons surprises many people during their first look-see. Actually, this aircraft does have an inboard set of aerodynamically (flight tab) driven ailerons between the anti-shock bodies. Although primarily used for pilot

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feel and lateral trim, they do provide 35 per cent of the total roll capability in cruise. Powerful rolling moments are produced by two large spoilers forward of the wing flaps on the upper surface of each wing. Outboard ailerons were eliminated because of aeroelastic, flutter, control complexity and weight considerations. The results have exceeded expectations with the aircraft responding with ease and with low breakout forces.

Primary longitudinal control is obtained from aerodynamically (flight tab) driven elevators. A movable horizontal stabilizer which can be driven hydraulically, electrically or manually, provides good longitudinal trim capability regardless of c.g., gross weight or aircraft configuration anywhere in the performance envelope. If a jam should ever occur such that the longitudinal trim could not be changed, split spoilers are available.

The anti-shock bodies were designed as a basic part of the upper wing surface to minimize shock wave formation. They efficiently reduce the high drag rise which has plagued earlier jet transports at transonic speeds as the upper surface of the wing goes supersonic. This is an engineering application of the same "area rule" principle which was used in the design of the hourglass fuselage of our F-106 jet interceptor, holder of the world speed record at 1525.95 mph. Additional design features were to sweep the leading edge back 39 degrees and make the wing thinner than any other jet transport. Because of their size, the anti-shock bodies serve a dual purpose of also functioning as integral fuel tanks. A total of 350 gallons can be carried in each of the inboards and 500 gallons in each of the outboards of the intercontinental version—the Convair 990 Coronado.

Tuck-under, characteristic of many swept-wing aircraft in the transonic speed range, is also apparent in this aircraft. However, it is mild. A tuck compensator is used on the 990 to provide a programmed horizontal stabilizer change as a function of Mach number. The pilot then feels that a normal longitudinal trim speed stability exists. This aircraft is still readily controllable with the tuck compensator inoperative.

ANOTHER aerodynamic phenomenon associated with swept wing aircraft is "dutch roll." Although the 990 is relatively stable as far as this interrelationship is concerned, a yaw damper has been installed. This will lessen pilot fatigue and prevent dry martinis from becoming wet ones back in the cabin! The yaw damper is not required for dispatching the aircraft, nor is it considered a flight safety item.

Stall characteristics are straightforward with aircraft buffet telegraphing the approaching stall in all configurations—like having a spunky marlin on the line. Buffet intensity increases with decreasing airspeed. Lateral control is quite positive during the stall approach because of the powerful rolling capabilities of the wing spoilers. Recovery from stalls is conventional.

Lower takeoff and approach speed requirements dictated installation of wing high-lift devices. Wing leading edge slats are located between the engine pylons and also outboard of the outboard engine pylons. Elevator power was limited with this configuration in stalling the aircraft. Krueger leading edge flaps were added between the inboard pylon and the fuselage. This produced a corrective, mild pitch-up characteristic which also aided in attaining an even greater climax. Another beneficial effect was the reduction of stall buffet intensity to a moderate level.

Using the wing spoilers symmetrically as speed brakes after touch-down ensures high aerodynamic braking. The wing lift is effectively reduced, allowing more efficient wheel braking (nose and main wheels are equipped with anti-skid brakes).

A new proportional anti-skid system is under development to increase braking capability on slick runways. Braking coefficients are improved by increasing or decreasing brake pressures such that the brakes are applying maximum braking just short of the skid point. Individual anti-skid elements are on each main wheel brake to provide the ultimate in braking.

The General Electric CJ 805-23 engine is a strong performer. Water injection is not required. This engine has an additional turbine stage and fan combined in a single wheel behind the basic jet engine. The inner section of this wheel is composed of turbine blades turned by exhaust gases. Turbine blade extensions operating in a peripheral by-pass air duct act as fan blades to pull air around the basic engine. This feature improves the basic engine effi-

(Continued on page 76)

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(Continued from page 75)

ciency up to 40 per cent. The acceleration rate is high, resulting in excellent aircraft wave-off characteristics.

The target type thrust reversers have two steel clamshell doors which form the aft section of the external pod surfaces when retracted for flight. Reverse thrust is quite effective with almost one-half the maximum forward thrust available for reverse use to take care of that icy runway when braking coefficients go awry.

Sound suppressors are not required on this engine because the mixing of the aft fan exhaust with that of the basic gas generator achieves the same result.

An air data computer (ADVISOR) developed by the John Oster Co. has undergone flight testing during the 880 certification program. It is available at customer request also on the 990. This computer records all pertinent aircraft performance continuously and gives answers instantly and clearly. Questions regarding takeoff, climb, range, endurance, and approach are answered automatically and the crew does not need to refer to complicated performance charts.

To provide the pilot the latitude to make landings on short notice after a maximum gross weight takeoff, fuel jettisoning is immediately available. No time need be lost in extending fuel dump chutes. Jettisoning can start with a "flick" of the switches with the fuel dumped well clear of the fuselage and empennage. Discharge nozzles permanently located in the trailing edge tips of the outboard anti-shock bodies are always ready without imposing a drag penalty. The fuel dump rate is well above FAA requirements at 2,800 pounds plus per minute.

Emergency descents may never be required in this bird, but the deceleration devices available if this is necessary are more than adequate. The main landing gear and nose gear can be extended to M_T (true mach) .83 and/or 320 knots CAS. There is an aircraft pitchup tendency as the gear is cycled down at these speeds, but this is readily controllable. The wing spoilers can be extended at any speed in the flight envelope giving the pilot plenty of flexibility to drop down to habitable altitudes in case of emergency decompression or to decelerate rapidly to the gust penetration speed.

Speaking of emergency decompression—the fuselage submerged in a large water test tank has undergone pressure cycling testing equivalent to 20 years of airline operation. The tests included maximum cabin pressurization cycles with flight gust loadings superimposed.

All cabin doors are of a plug type design. They are contoured to match the fuselage curvature, but are wedge shaped in plan form. This keystone shape plus a downward sliding motion into steel tracks along the door frame when closing precludes any inadvertent door opening in flight. The cabin windows are each made of three transparent plates. Knocking one out with a sledge hammer will still not endanger the cabin occupants as one of the other panes can withstand full cabin differential. The third is a thermo pane providing clear visibility regardless of altitude.

Flight Test is utilizing five Convair 990s and a sixth is engaged in static test. This program will lead to issuance of a Federal Aviation Agency airworthiness type certificate in December.

A provisional type certificate will be issued in October coincident with initial deliveries to airlines. Under the provisional FAA ticket, airlines may use their 990s to train flight and ground crews and for route familiarization work so that all will be in readiness for commercial operations when the commercial certificate is issued in December.

American Airlines, whose original order for 25 transports initiated the 990 program, will take delivery of its first aircraft in November.

Swissair and Scandinavian Airlines System operating in a consortium will take delivery of nine aircraft jointly—seven to Swissair and two to SAS. Two of the seven Swissair aircraft will be leased to SAS and will carry SAS striping. One Swissair and one SAS marked 990 will be delivered in October.

REAL Aerovias of Brazil will take the first of their three 990s in November.

All airlines will start commercial service at about the same time after issuance of the commercial FAA type certificate in December.

The 990 is designed for both domestic and intercontinental operations. With full reserves it carries sufficient fuel for maxi-

CONVAIR 990 AND CORONADO

Performance:

Cruising speed	640 mph
Range (full first class payload, normal reserves, at long range cruise at 35,000 ft.)	4,300 statute miles
Stalling speed (landing configuration)	105 mph
Maximum cruise altitude	41,000 ft.
Rate of climb (sea level, normal power, takeoff weight)	3,250 ft/min.
Fuel consumption (30,000 ft., average cruise power)	1,530 gals/hr.
Takeoff CAR runway for 2,000-statute-mile trip	5,350 ft.
Takeoff CAR runway for 1,000-statute-mile trip (sea level, standard conditions)	4,600 ft.
Landing, CAR runway	4,770 ft.

Specifications:

Passengers, all first class (all coach: 121)	96
Payload (first class) (coach: 29,245 lbs.)	25,120 lbs.
Fuel (Coronado: 15,675 gals.)	15,119 gals.
Oil	28 gals.
Cargo	928 cubic ft.
Wing span	120 ft.
Wing area	2,250 sq. ft.
Length	139 ft., 5 inches
Height over tail	39 ft., 6 inches
Maximum landing weight	180,000 lbs.
Maximum takeoff weight (Coronado: 244,200 lbs.)	239,200 lbs.
Maximum ramp weight (Coronado: 245,000 lbs.)	240,000 lbs.
Maximum zero fuel weight	154,000 lbs.
Engines: four General Electric CJ-805-23 aft turbofan jet engines equipped with thrust reversers.	
Engine thrust	16,100 lbs. each.

mum-range trips of 4,300 miles or premium speed trips up to 2,860 miles. The Convair 990 Coronado has equal range but with the added fuel reserves required for over-water routes.

American Airlines has not released route cities for the 990s, but this aircraft has performance versatility either for coast-to-coast service or for medium range schedules. Economic operation on medium range routes is enhanced by the rugged structure of the 990, built to withstand the many extra landings and takeoffs of such service; the relatively short runway requirements and the ability to land with a relatively large "en route" fuel supply remaining on board.

Passenger capacity of the 990 varies with individual airline interior. Configured as an all-first-class airplane with four-across seating throughout, the 990 will carry 96 persons. When converted to all five-across the total is 121. American will use a combination of 57 coach and 46 in the first-class and lounge sections for a total airplane capacity of 103 persons.

Already airline flights crews and ground crews are going to school at General Dynamics/Convair in San Diego acquiring a thorough knowledge of the aircraft systems and flight characteristics. A cockpit procedure trainer is used to acquaint pilots and systems engineers with the functions and operations of the airplane.

Flight testing the 990 indicates that these four and three-quarter million dollar transports are fine flying machines, should provide luxurious, reliable transportation and operate as efficient money-making tools for the airlines. END

Crash Protection

(Continued from page 47)

five G to the side. There must be a minimum clearance of 44 inches in front of the occupant's seat. Also, the direction of deceleration would have to be largely in the fore-aft axis of the aircraft, without serious sideward forces or gyrations such as tumbling or cartwheeling.

The belt must be pulled tight across the pelvic bones at the crease of the hips, allowing no slack for abrupt jolting overloads; it should lie at a 45-degree angle to the long axis of the aircraft. A belt of 3,000 pounds strength should be adequate, allowing for some fabric deterioration after installation in the aircraft.

With the seat belt alone, sudden deceleration causes the trunk, arms, and head to fly forward and downward, while the legs fly forward and upward, as the body jackknifes over the belt. Additional restraint of the upper portions of the body by a shoulder harness is necessary to prevent violent deceleration in modern aircraft with small clearances between occupants and seats or panels. Again, proper use of the harness involves certain precautions.

The harness should be slightly looser than the lap belt, so that the latter can transmit the initial impact to the pelvic bones. If the harness is too tight, it tends to pull the lap belt upward, bringing severe decelerating force against the soft parts of the abdomen; and as the legs flail forward and try to drag the body with

(Continued on page 78)

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(Continued from page 77)

them, the body tends to submarine out from under the lap belt. At the least, this results in acute forward tilting of the pelvis which can cause compression fractures of the spinal vertebrae.

These problems can be handled by the use of "inverted V" thigh straps, which restrain the forward movement of the legs, prevent the pelvic tilting, and halt the submarining tendency.

If the head is held forward at about a 45-degree angle at the instant of impact, there is no serious tendency for the slightly loosened harness to snap the head forward with unpleasant effects on the neck vertebrae. A shoulder harness should never be more than slightly loose at the time of impact, however, since it would then actually increase the peak load well above that which is experienced when the harness is properly adjusted.

A shoulder harness tends to throw the greatest strain on the collarbones, and if too loose will allow the upper part of the trunk to bend, throwing tremendous pressure on the edges of the vertebrae, often with resulting compression fractures.

THE advantages of a restraining vest over shoulder harness has been demonstrated in experiments on dummies.

In all cases, it is vital that the anchorages of all restraining devices be adequate, usually through attachment to the basic structure of the aircraft. All restraining devices should have ready releases which will operate after the crash.

The relative safety of forward-facing vs. rearward facing seats has been carefully studied, without a complete solution. It is true that rearward-facing seats with lap belts allow peak decelerations of 30 to 40 G over 11 seconds with only mild injury and discomfort; also that a forward-facing deceleration with a two-inch lap belt restraint causes *local* pressures seven to ten times greater than those caused by an equal rearward-facing deceleration.

A peak of 82 G has been survived with complete body support in an aft-facing seat. These advantages, however, have little meaning unless considered along with the adequacy of the seat anchorage, severity and direction of crash load, the amount of cabin destruction and of destruction close to the occupants. For the time being, the controversy between rearward vs. forward-facing of seats cannot be settled at a practical level, though the former seems to have the edge.

The head, with its special importance and vulnerability, is unfortunately the most commonly injured portion of the body in aviation crashes. In both USAF and lightplane accidents, head injuries were the most common injuries and occurred in 88 per cent of all survivors. Helmet protection, necessary in military flying, is no longer popular in general aviation.

Yet an increase of one inch of displacement, such as by the partial crushing of a non-resilient foamed plastic helmet, would decrease the average deceleration of the head in a crash by about 25 per cent. A helmet should effectively distribute crash forces over the entire head, preferably away from the most vulnerable portions of the skull. If this is done, the severity of a localized blow can be reduced by 1,000 per cent or more. Scalp laceration and skull fracture may be prevented, even though brain concussion is more difficult to avoid.

Aircraft structure limits the effectiveness of all other protective devices in crash injury. Its basic structure and the seat anchorages need to be stressed to withstand peaks of 20 G and higher when possible, especially in the fore-aft axis of the aircraft. Rigid projections, instruments, levers, braces, etc., which might deliver a localized blow to the head, should be eliminated in the initial designing of the aircraft.

Elbows and arms should be kept off arm rests unless the latter are non-rigid and are designed to move downward with the seat-pan during vertical impact, in which case a proper grip on them will ease the vertical load on the spinal column and help to avoid vertebrae fractures.

Control wheels and columns, when possible, should be constructed to absorb a great portion of the impact forces against the chest and ribs. The materials of the instrument panel should fail gradually under the impact of the head and body against them, allowing great absorption of energy for less injury.

In helicopter crashes with high vertical impact loads, the seat can be hinged at the front end and supported rearward by shear-pins above energy-absorbing materials such as deformable plastics, horsehair, nylon, or hydraulic bleed pistons. Such materials or devices, if compressed a mere three inches, can cut a crash load of 220 G (44,000 G/sec) to only nine G (250 G/sec) at the shoulder level—a better than ten-fold increase in human tolerance to the actual crash load. In helicopters as well as fixed-wing aircraft, lap belts and harnesses must be secured to the basic aircraft structure for maximum effectiveness.

AIRCRAFT occupants can reduce the danger of deceleration injury by certain ordinary precautions and procedures. Rigid objects and unyielding projections should not be stored beneath seats which may fail from vertical impact loads. Impact forces transmitted through the feet and legs to the body can be decreased as much as 36 times if the feet are placed against non-rigid supports such as ductile rudder-bars, with the knees bent slightly to an angle of 160 degrees. This position also considerably lessens the strain against the lap belt.

A firm hold on the control column can decrease the load on the spine in vertical crashes. Clothing about the neck and front of the chest should be loosened or removed if necessary, to prevent them from riding upward forcefully against the neck and larynx with the crash-pull of the harness straps. Also the chin may be snapped downward against the chest and the occupant dazed, but serious injury is not likely.

Ejecting or bailing out at higher altitude, in a straight or climb attitude, will avoid the downward momentum from a dive.

A small but important point—if the aircraft noses over, *don't* release the lap belt and harness too quickly. The occupant who has survived an astonishing G load in the crash can sustain a fatal neck fracture from this hasty maneuver. END

Airwork

(Continued from page 39)

Grumman Aircraft, RCA, Republic Aviation, Sperry Gyroscope, Texaco, U. S. Steel, and 59 other foreign and domestic airlines and corporate fleets. In servicing big business, Airwork has become big business itself.

How does it work? What does it take for a company to rise from nothing to one that services the fleets of the best-known corporations and airlines in the world?

It takes, among other things, organization. When an engine rolls into the Airwork shop for overhaul, it faces six specific operations before it rolls out the opposite door as a finished and guaranteed engine: disassembly, cleaning, inspection, rework, assembly and test.

First the engine comes completely apart. The generator, starter, carburetor and other accessories are sent to the accessory shops in another building of Airwork's 17-building complex at Millville. Then the basic engine is taken bolt from bolt (there are more than 10,000 parts in an R2800) and placed on a three-tiered dolly reserved for parts from that engine. Cylinders are put on a separate dolly. Parts from one engine are never mixed or interchanged with parts of another; after overhaul, the customer gets back only his own or new parts in his engine.

Airwork puts great emphasis on working with clean parts. The heavy-laden three-tiered dolly rolls only 40 feet from the disassembly section before each individual engine part is blasted under a 75-psi stream of Savasol, a kerosene-base solvent. From that section on through the plant, the area as well as the parts themselves are clean to the point of being immaculate. Many parts, however, are not done with cleaning when they emerge from the solvent blast. Airwork experiments with cleaning methods, and has discovered that for the removal of carbon from cylinders and pistons, a mixture of pecan shells and rice hulls does the best job. Cylinder heads receive a blast of aluminum oxide chunk that not only cleans them, but strengthens them by relieving internal stress in the metal. Pushrods in the R1340 engines have their own special blast of tiny glass beads.

BY THE time the engine parts reach the inspection section, they are as clean and dry as new parts.

Inspection is the single most important section of Airwork's operation, the one that is most directly responsible for gaining the company a reputation that brings a growth of about one million dollars net sales every year.

The inspection section of the plant is a quiet place, where sounds from the shop are absorbed into shelves of inspection records and manufacturer's tolerances. One mechanic in every six at Airwork is an inspector, and they think, as well as assure quality of parts and assembly. One inspector, for instance, discovered on his own that if all the assembly tolerances on a well-known engine were allowed to accumulate to the 'plus' side, it would be impossible to turn the propeller shaft when the engine was reassembled. After a brief, embarrassed silence, the manufacturer modified the tolerances.

During inspection, steel parts of the engine are magnetized, submerged in Magnaglow penetrant, and checked under an ultraviolet lamp. In the eerie bluegreen, imperfections and cracks show as bright yellow-orange streaks against the dark metal. Non-ferrous metals get a similar treatment under the name of Zyglow.

Turbine wheels from Rolls-Royce Dart engines come in for an inordinate amount of inspection. Every one of the engine's 331 turbine blades gets a thorough cleaning and inspection; at prices from $75 to $103 a piece, it is much more economical to inspect a blade than it is to arbitrarily replace it during overhaul. Blades are soaked in caustic soda, then in nitric acid. They are vapor-blasted to remove scale, and etched in cold ferric chloride. Then they get the Zyglow treatment after immersion in a super-penetrating indicator. Each blade, cast from a Rolls-Royce alloy called Nimonic steel, is given a hardness test. Here a diamond-point, ground to a 136-degree angle and backed by a five-kilogram weight, is dropped straight down onto the blade and leaves a tiny square depression on its surface. Under a microscope, the dimensions of the depression is measured in microns (thousandths of a millimeter).

If the square is too large, the metal has been softened beyond tolerances and the blade is rejected.

(Continued on page 80)

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(Continued from page 79)

As the blades pass the hardness test, they are fitted back into their turbine wheel (which has itself been inspected under a microscope for flaws) and checked under a binocular magnifier. As the inspector inches the wheel around beneath the lenses, he watches for cracks and imperfections at the serrated root of the blade, called the 'fir tree'. When he sees a possible crack, he advances the magnification to high power for a closer look. "It takes a man with good eyesight—and patience—to inspect 331 fir trees from four angles over three wheels," said Ian "Scotty" Wright, Airwork quality control chief. Turbine wheels are the critical parts of a jet engine, and the most expensive. Cost for installing new blades on the smallest Dart turbine wheel is $10,981; there are three turbine wheels in each engine.

A few feet from the hardness tester is an unimpressive-looking table, four feet square, whose top is protected by a fitted felt cover. Under the cover is a flat surface. Airwork uses the tabletop to check the flatness of mating engine parts, and to get it they had to special-order a black granite slab eight inches thick and weighing 2,400 pounds. It was ground and polished to be flat within 50 millionths of an inch per square inch. The maximum differential across its 16 square feet of stone is one ten-thousandth of an inch. The tabletop rests on the same three points it rested while being ground and polished so that there is no tendency for the stone to sag out of its flatness.

The tools used to measure and inspect are themselves tested against standard-size blocks whose only superiors are found in the sub-basement of the U. S. Bureau of Standards.

But tools and standards aren't the basis of Airwork's inspection. The real heart of the inspection section and of the company itself is its attitude toward its job. Striving to demonstrate this intangible thing, Scotty Wright walked briskly to a bin of red-tagged and rejected parts. Lifting a harmless-looking intake manifold section from the bin, he held it as distastefully as if it had been machined from solid evil. "Look at this," he said. "When this manifold came in here, it was silver-soldered together! Now what do you suppose would happen if this engine had one good backfire? It would break? A fire? Now Airwork couldn't send that out."

WRIGHT'S zeal gives him the job of complaint-straightener. When a customer doesn't understand why a part of his engine was rejected or why a new one was installed, it is Airwork policy to send him to Scotty Wright in quality control. By the time the straight-talking inspector is through explaining and demonstrating why the part was not acceptable and the dangers involved if it was allowed to remain, the customer is grateful that Wright was there to reject it.

Because of this attitude, it costs the customer 10 to 20 per cent more money to have an overhaul done at Airwork than at other facilities. The same attitude, though, can mean substantial savings for Airwork customers. Some time ago, for instance, Dart operators were discovering tiny spirals of metal in their engine oil filters. Since metal in the oil usually indicates failure of some part of the engine, one operator decided to remove his engine and send it to Airwork for an inspection. The Rolls-Royce representative stationed at Millville asked the operator to wait while he examined the metal chips, which were in themselves too small to damage the engine.

The spirals were the clues. Dart engines use one-half pint of oil per hour, and oil is added from quart cans when needed. The Rolls-Royce representative experimented, opening several cans of oil with an automotive-type spout used by Dart mechanics. He strained the oil as it left the cans, and found in his strainer the familiar spiral chips, sheared from the can by the opener.

THE engine inspection was not required, a $3,000 inspection was saved, and Dart operators now strain their oil as they top off the tanks.

From inspection, the engine parts go to the reassembly section, a brightly lighted new addition to the building completed in September, 1960. Nearing the end of the 35-45 days that a piston engine needs for its overhaul, it is taken half a mile down the road to the test stands. Here it is fitted with a stub propeller, mounted on a stand, and connected to wires and tubes leading to rows of indicators inside the concrete blockhouse. The engine is run on its stand for four and a half hours. During these hours, it is tested as carefully as are the Dart engines in their sophisticated dynamometer, and in addition, the engine oil is routed through a strainer in the blockhouse to give the inspectors another visual check on engine wear during the break-in period.

Though turbine engines are the mainstays of future flight, and Airwork's turbine overhaul has jumped from nothing to become eight per cent of its business in the last six months of 1960, the piston engine is not on its way to quick extinction. As large airlines sell their conventional airliners to smaller operations who do not have their own overhaul facilities, Airwork is doing more piston business than ever. To date, most overhaul work has been performed on the big 2400-hp Double Wasp R2800 used in the Martin 404, the Convair 440, and the Douglas DC-6. Airwork is currently overhauling about 14 piston engines and one turbine each week. Normal overhaul costs on an R2800 run $8,500 to $9,000, while a Dart operator will pay around $11,500 for his 21-day engine overhaul.

The company does little work on the smallest aircraft engines, but this is not because it disdains the business of the common pilot and aircraft operator. Small engines simply do not need the extensive facilities that Airwork uses, and can be overhauled just as well for a lower price at smaller establishments.

If a customer desires to have work done at the big plant, however, no one suggests he take his business elsewhere. Recently a lightplane owner sent a single piston to be fitted with new piston rings that he had purchased. Total cost for the job: $5.50.

That is Airwork. A company in the horsepower business, conscious of the meaning of quality, realizing that it works with people instead of with figures and dollar signs. With that philosophy, Airwork will be growing for a long time to come. END

Army Instruments

(Continued from page 35)

effects, acceleration error, skid error, caging and uncaging discrepancies are all impressed on the potential instrument pilots.

Each individual instrument on the panel is covered: the altimeter, airspeed, vertical speed, directional gyro, attitude indicator and turn slip indicator. The intricacies of each, its precise construction, is explained; mockups and cut-aways are used.

Various navigation and approach systems from the old four-course, low-frequency range to homers, VOR, TACAN, ILS, and GCA—any system which may be of value to an Army aviator whether he be entering the high density area of the New York City complex or letting down on a single homer at Taegue, Korea—is included.

In any instrument or weather situation, vertigo is always a factor to safety of flight. A thorough indoctrination of causes, effects and methods of combating vertigo as well as other sensations of flight is a part of this comprehensive ground school program.

The Ross synthetic trainer division at Post Field is complete with five ANT-18 Link trainers modified to include their own traffic control center, approach and departure controls. Twenty-four VHF frequency channels are available to stimulate in-flight traffic conditions. Four VOR or low-frequency homer stations plus one ILS may be preset on the trainers and complex cross-countries are flown.

The system used in setting up the radio situation is unique to the Ross trainers; each "crab" has four small antenna above it for the VOR and homers, and a single antenna below for the ILS. By positioning these antenna relative to electronic signals transmitted from an overhead rotating panel, or from below in the case of the ILS, appropriate signals are transmitted to the instruments on the trainer. Trainers may be operated in conjunction with each other or separately as the specific lesson requires. Individual instructors may be used or a single instructor may monitor and control the entire group.

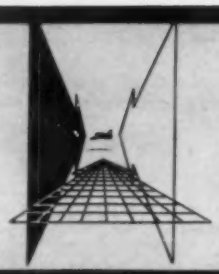
Ross' Link instructors feel that a pilot should learn to fly the trainer first then go to the procedures—you have a hard time trying to learn them both at the same time. The Army acceptance of the Links is verified by the fact that they allocate 40 hours to be flown by each student; more than 10 cross-countries are flown in these trainers in addition to a multitude of ILS, GCA and various holding and interception problems.

The prime portion of any flight course is the flying. The Army school is no exception, and the students look forward to the 70 hours of intensive flight instruction which transforms them from VFR pilots to IFR specialists.

The flying phase is sectional. First comes the basic instruments at the rate of 1:35 hours per day, and then radio and navigation at two to three hours per day. The basic phase is replete with maneuvers which develop rapid cross-check and intelligent instruction interpretation.

The "vertical-S," for instance, is a rate maneuver on a single heading; initially a

(Continued on page 82)



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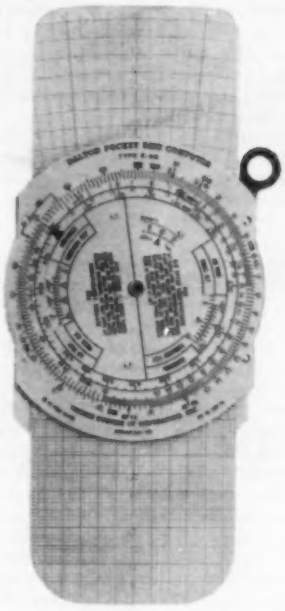

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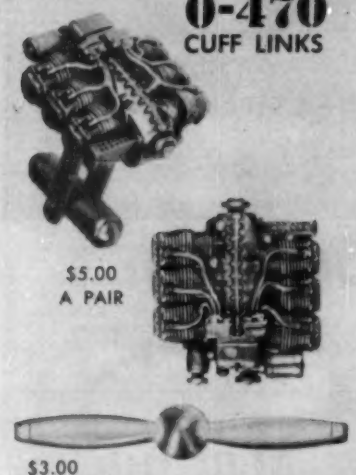

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(Continued from page 81)

climb of 500 fpm is established and held for a 500-foot gain in altitude. With no hesitation it is transformed into a 500-fpm rate of descent and to the original altitude; then a 400-foot climb and descent, 300-foot, and finally 200-foot. And all at a 500-fpm rate.

The "Vertical S-1" is an identical maneuver except that a standard rate of turn is made simultaneously with a change of direction at the bottom of each descent. These two maneuvers are the "lazy eights" and "chandelles" of instrument flying.

The "A" and "B" patterns have been changed from the meaningless ones of WW II; the new series are made up of turns and straight flight with climbs and descents to simulate such practical maneuvers as procedure turns, holding patterns, GCA, ILS and missed approach or emergency pull-ups. The Pattern "A" is still a partial panel maneuver while the "B" uses full instruments.

Unusual positions and steep turns are still much a part of the curriculum. These maneuvers, practiced to proficiency, are life-savers to the light-aircraft pilot caught up in turbulence or with failing attitude indicators.

The low-frequency four-course range work is completely gone from the navigation phase—no more orientations, close-in procedures or fades and builds.

"We just don't believe it is worth while," says Blair. "You can't even flight plan via low freq from here to the west coast any more." Emphasis, rather, is placed on more useful procedures such as VOR and ADF, which the Army feels are "today's common system."

Stateside, omni coverage is complete, supplemented with ADF homers. Overseas the homer takes precedent except for a few bases served by VOR facilities. The Comanches are not TACAN equipped for, according to Blair, the airborne equipment is too heavy for most light Army aircraft. Ross is prepared for TACAN when the requirement is established.

In training, VOR is utilized as the basic aid and initial procedure turns and holding patterns are taught on the station before advancing to the intersection type holding. "Victor airway" cross-countries are flown daily in the navigation phase. Located approximately half-way between Wichita Falls, Texas and Oklahoma City, the facilities of these areas are used daily under simulated and actual weather conditions.

WHILE the aircraft are restricted to Army Jeppesen published minimums for landings, takeoffs are frequently made under zero-zero conditions. They do not clear into known thunderstorms or icing conditions; yet they have been caught in each and the little airplanes came through with flying colors.

How do the instructors feel about single-engine weather flying? Archie Parks, veteran instructor, says "We carry parachutes on all IFR flights, but unless the engine failed over an extremely low ceiling or I was in mountainous terrain, I think I would ride it down and make a forced landing after dropping out of the bottom of the clouds."

Once in each class, the Piper Comanches head south for Fort Worth on a student cross-country and a trip to the air traffic control center. Here they get the facts of traffic control direct—learning how the center works and the "whys" of traffic control.

As the course draws to a close, the extended cross-country is the big issue. The Comanches fly out in all directions, going as far as the coasts and back. They seek out weather of all sorts, use the facilities they find—they use their newly acquired skills to the fullest before returning to graduation and the valued Army instrument certificate.

The 1961 Comanches are well fitted for their task. Ninety-gallon fuel capacity gives an easy six-hour range, seven if economical cruise control is used.

THE aircraft use Aircraft Radio Corp. nav/comm equipment of the Starflite I series consisting of one ARC-210 VHF transmitter and receiver, one Type 29 ADF (ARN-59) receiver, one ARC-15E omni receiver, one T-11 standby transmitter, an R-31A glide slope receiver and a three-light marker beacon.

The choice of having only one omni receiver on board is stoutly defended by Blair and his instructors as being adaquate for navigation, point-to-point clearances and intersection holding. They say that with good wind drift correction and proper technique the second omni is unnecessary. It is doubtful that they could get one single ATC center or approach controller to agree with them.

The instrument panels are well laid out and a point worthy of note is that these experts of instrument flight have seen fit to move the manifold pressure gage from the right side of the panel to directly to the side of the flight indicator.

"This is absolutely essential if proper power control is to be maintained during minimum ceiling and visibility approaches," says Blair.

The Lycoming-powered Comanches average 100 flying hours every 26 days. The engine manufacturer recommends overhaul at 850 hours, yet the aircraft are consistantly exceeding 1,100 hours before it is necessary to rebuild them. This FLYING editor flew two school ships; one of these turned the 1,100-hour mark during the flight—it was as smooth as silk and still burned very little oil.

The nine aircraft are maintained by one A & P and two helpers.

"We don't wear them out taking them apart and putting them back together," said Blair. "When something goes wrong, we fix it." Of course regular inspections are made. Seat covers are used and at the end of approximately a year the aircraft are sold. The way these boys fly, that would mean they would have approximately 1,200 hours or so on them.

Ross has developed the fixed-wing instrument training to a fine point. Ninety-eight per cent of the students entered have graduated successfully. The next step in the program is to add a helicopter instrument flight school for here, too, the elements have to be mastered. Many Army pilots are dual qualified and the helicopter must measure up.

Ross operations in the Tulsa area are

totally civilian. Besides being the state distributor for the entire Piper Aircraft line, a flying school and tech publishing operation is conducted. Ross "questions and answers" to the FAA written examinations are sold in booklet form. A new offer by Ross is a no-down-payment private pilot course. For $9.43 per week for 18 months, a private license is given as fast as the individual wishes to take it—this is about as far as you can go financially to get people to fly. In addition, Ross offers all the standard flight courses such as commercial, instrument, ATR as well as private pilot. END

Helicopter Blind Flying

(Continued from page 45)

the greater becomes the pilot's concern with his position in respect to the ground. With the ANIP projected display, the grid pattern gives the pilot the corresponding image that he needs to check his ground speed and position.

In a hover with limited or no visibility, heading and zero airspeed are maintained by setting the helicopter at an intersection of four grid squares. While the size of the squares increase corresponding to the aircraft's proximity to the ground, the pattern could not be considered an accurate gauge of altitude.

Since it is this low airspeed capability that the military wishes to capitalize on to tactical advantage, low-altitude flight and remote area landing have become an important part of ANIP research.

The simulator, the first step toward ANIP's instrument helicopter, represents an achievement in design engineering itself. Basically it consists of a platform, developed under sub-contract by the Franklin Institute of Pennsylvania, capable of reproducing the short-term accelerations of helicopter flight. These provide a motion stimulus for the pilot. This requirement for simulator motion, based on the need to test pilot response, was accomplished by building into the platform translatory displacements of eight feet in heave, seven feet in sway, and 20 inches in surge. The equations for motion to simulate actual flight motions as closely as possible are programmed in the analog computer.

Mounted on the simulator platform is a completely enclosed Bell HTL-7 cabin.

Seated inside, the pilot goes through a routine starting sequence. Engine and rotor noise, controlled by computer outputs, are fed into the cabin through a stereophonic hi-fidelity unit. This noise coupled with cabin vibration, independent of the platform, completes the realistic setting.

The controls for flight are standard for piston helicopters. A collective pitch lever changes blade angle for the lift vector, a twist grip throttle maintains rpm, a cyclic stick governs direction of flight, and directional controls pedals counteract main rotor torque.

Manifold pressure and rpm are read on a level and to the right of the display area while an acoustic altimeter is mounted at the left. The altimeter, a Bendix product, is accurate down to approximately six inches and has a range from three to 300 feet. Situated at eye level directly in front

(Continued on page 84)

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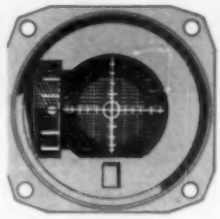

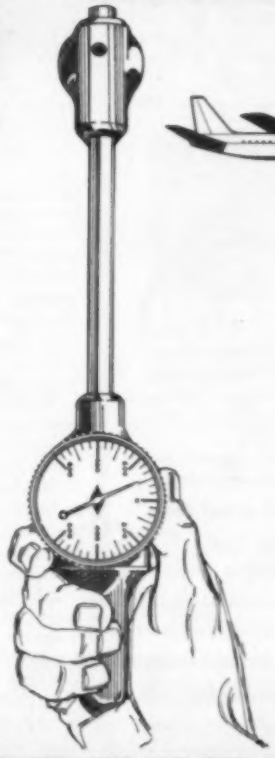

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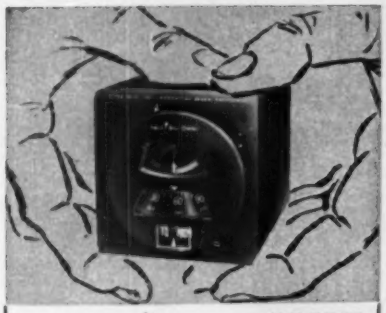

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DRIVE IN!

(Continued from page 83)

of the pilot and projected on the canopy is the contact analog grid image itself. It is generated by an opto-mechanical device and projected from the rear of the cabin over the pilot's shoulder.

When the first tests were run late in 1959, it was apparent that a method of scoring was necessary if progress were to be determined. Sensors for desired position as opposed to actual position, rate of display motion, and rate of control motion create the pilot's score through the number of control reversals he is required to make.

It was this pilot's feeling that in hovering flight the simulator was far more sensitive to control manipulation than the average helicopter. This is an advantage in that by scoring well in the simulator the challenge of actual instrument flight will

Helicopter instrument panel.

be less demanding, and, thereby, a safer proposition.

At the present stage of simulator development a difficulty arises in that the engine instruments could not be monitored at the crucial point of pickup without the pilot disorienting himself in relation to the display. Other items worth mentioning that limit the prototype, were the lack of a warning device for malfunction of the display, and the display size, which creates some measure of fatigue (the pilot must hold his head in a set position to keep the display image within view).

With the advent of more stable rotorcraft and the increased use of the turbine engine, which allows rpm to be governed automatically, the scan will be simpler.

Holding position on the grid pattern was a ticklish affair for the first nine or ten minutes, but after that period control anticipation picked up and position was held rather well.

Along with the simulator program ANIP has advanced into flight testing its new and unique devices. Two Bell helicopters are employed in the task. Research Helicopter No. 1 (RH-1) is an HTL-7 and RH-2 is the turbine powered HU-1 Iroquois.

The objective of the RH-1 is to provide on a transparent display medium the simplest version of the contact analog grid to permit preliminary evaluation of the concept in actual flight. Since the cabin and controls are the same as that on the simulator, almost simultaneous experiments, first in the simulator and then in the aircraft, are being accomplished.

In the RH-1 with its plexiglass bubble the North American Autonetic projection system is used for the display.

A three-phase test program— flying a contact pattern, semi-contact, and full display— has been undertaken. With non-instrument pilots as subjects, the vertical display will be put through an IBM scoring system to check each flight for progress and for areas of greatest difficulty.

The results of the vertical display scores represent only the starting point of Bell's plans for the RH-2. Into this helicopter will go an entire ANIP system for evaluation. The system will be designed to permit independent operation from one unprepared landing area to another.

The RH-2 will be equipped with the ANIP developed Ku band radar, which provides terrain clearance information on the vertical display as well as map information for en route flight. Return from objects above flight elevation is in red and return from objects below is green. RH-2 stabilization will be provided through computers. Installations also include a central control digital computer, an APN 119 doppler transceiver, and a horizontal situation display.

The RH-2 will be the recipient of all ANIP research as it is proved ready to be phased into the program.

While the display system is considered the key to the future of instrument flying, ANIP already has achieved results. A landing system which the Army calls the Interim Integrated Instrumentation and Letdown System and Bell has named "RAILS" for Remote Area Instrument Landing System, has come out of ANIP research and has been delivered to the Army for evaluation. This complex device is designed to provide operations at or near zero visibility into known, confined, remote areas by helicopter pilots with a minimum of instrument flight experience.

The system uses a small battery-powered ground beacon that can be carried by hand and placed in remote or mountainous areas where conventional navigation systems are not available.

A lightweight radar in the helicopter activates, locates and then tracks the heliport ground beacon, which is only eight by ten

Simulator and computer.

inches in size. Up to ten aircraft may operate simultaneously on any one beacon.

Utilizing the beacon as a position reference plus airborne radar for terrain avoidance information, the system can guide the pilot through approaches and touchdowns on selected landing spots in remote areas.

Interest in the progress of ANIP has been generated throughout the industry. Over 500 companies currently are engaged or interested in the program and constantly request the latest information.

Relieving the pilot load in this complex air age is a matter of growing importance as both military and commercial operators demand more all-weather flight to meet their expanding schedules.

The public and the pilots themselves demand a greater margin of safety. ANIP's giant step can represent that margin. END

Wind in my Petticoats

(Continued from page 27)

novice on. My ego was immediately deflated when John, after trimming the plane for straight and level flight, said, "I want to show you how easily the plane flies itself. Take your hands and feet off the controls and watch."

Off the controls? He was really asking for it! I figured it was his neck, too, so hands off, feet off, we flew merrily along better than we would have with my inexperienced assistance.

"How wonderful!" I exclaimed. John looked pleased.

"All right. Now push the wheel forward," John directed. Immediately we started diving, and my sense of well being faded fast as the plane's nose pointed downward and the ground stared me in the face.

"Now let go of the wheel," my instructor continued. By this time I felt no match for the superior flying ability of the little plane. Releasing my tight, clammy hold on the yoke as we went down, down, down, I marvelled as the Tri-Pacer came back to straight and level flight.

What an exhilarating feeling the first time you sit behind the controls of a plane and go zooming about in the air! This feeling has never left me, and I still thrill with anticipation when I head for the airport. A trip over the city this first time up while I "Oh'd" and "Ah'd", even to picking out our house, and the die was cast. I was anxious to try Lesson Two.

In the weeks that followed, the thought entered my head, "All right, so I can get the plane off the ground, but how do I get it back down?"

Pilots with thousands of flying hours logged thought this question simply hilarious and in a serious, buddy-buddy manner said, "What goes up, comes down, so why worry? As a last resort, Betty, there's always the panic button."

"But where is it located?" I'd ask. "I've never seen such a button on the Tri-Pacer." At this they would go into gales of laughter.

I wanted to believe so badly that it was a long time before gullible me realized there was no such button, no magic alternative for landing the plane. It was like hearing there was no Santa Claus.

I'll never forget the first time I tried to land that sweet and gentle little plane. John and I had just taken off and were going around the traffic pattern. As we turned from downwind to the base leg and then onto our final approach, he told me to "hold her in a steady glide at 90 mph. The wind is drifting us to the right," noted John as I tried unsuccessfully to keep the plane headed for the white lines at the center of the runway. That runway looked much too narrow to me!

"Tip your left wing down some and keep it going straight by pushing right rudder," John advised. "Now when you're about 20 feet off the ground, start your flare out and level the plane for touchdown."

"Boy!" I thought, "here I'm going 90 mph headed for the ground, and he thinks I can tell when there is only 20 feet left!" Naturally I decided to play it safe and

(Continued on page 86)

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(Continued from page 85)

started to level off too high.

"Don't flare out too soon," warned John.

As I tried to follow his advice, I overcorrected, and we contacted the runway too steeply and too fast. The plane ballooned into the air about 20 feet, banging down again for another good-sized hop. That little old plane was undecided about whether to go down or up and did both alternately until John applied an experienced hand to the controls. His dry remark at this time was, "It *will* bounce higher."

In demonstrating how to land properly, he always greased the plane onto the runway. I puzzled at the results I invariably produced.

My next landing attempt, same old hoppity-hop as before, prompted this remgark from the sidelines, "Mrs. Haesloop, you certainly don't use much of the runway, just a little bit here and a little bit there—must be the kangaroo juice they put in the Tri-Pacer today." Even my gullibility had its limits, and I realized kangaroo juice was in the same category as sky hooks, tent locks, and of course, panic buttons.

"John, I'll never learn to fly," I lamented more than once. He was always reassuring during these "can't" periods and explained. "If you didn't have what it takes, I'd cancel you out right here and now. Rome wasn't built in a day. Look at the progress you've made in the short time you've been learning."

I had progressed enormously, and these lectures restored my confidence and spurred me on to try—again—again—and again.

Books began coming my way—classics such as "CAA Rules and Regulations," "Path of Flight," "The Pilot's Weather Book," "The Pilot's Radio Book," and "The New Private Pilot." These I devoured like a hungry teenager, and the more I read, the more confused I became. There were so many odds and ends flopping around in my tired old brain. I realized I hadn't even scratched the surface yet! As time went by, I found that more and more "musts" became ordinary routine and the odds and ends began to make sense.

One September afternoon Ralph came rushing in full of glad tidings.

"Betty, Elaerco is talking of selling their instruction plane!"

"They are?" I asked, now just as excited as he. "When? How much?"

Questions came tumbling out and he answered them as best he could.

"Me not interested?" I thought. "Just look at me now!"

My heart was certainly ruling my head, for regardless of practical reasons against owning, I could see that until we bought an airplane and tried it, neither of us would ever be satisfied.

And so it was that the "Ralphabet," short for Ralph and Betty, joined the family.

Owning our own plane added even more fuel to the fires, and we found ourselves heading toward the airport every free moment and then some.. Ralph and I talked flying until the children remarked more than once, "Can't you two think about anything else?"

Nothing hits you more forcefully than when the word solo, which means *Alone*, is applied to airplanes. To solo is to go up unaccompanied, with no instructor sitting comfortably next to you to correct your mistakes; just you, the plane, and the tower.

This particular day, late in September, was beautiful, with no wind, which I now regarded virtually as a mortal enemy because I couldn't master things with still air, let alone when it got to moving around. I checked out the plane and got in with Bill Robbins right behind me. Tall, reddish-haired, pipe smoking, quiet and very relaxed, he knows and teaches flying well. He hadn't said a word about solo, evidently classified as top secret, so I was happily ignorant of things to come.

The takeoff went well, the landing adequately safe, and I did several touch-and-go's around the field. After three of them, Bill said, "Make a full-stop landing and go back to the hangar."

Unsuspecting, I thought he must have another lesson to give and this was it for the day. Back at the gas pumps, Bill climbed out of the Ralphabet, and as he was closing the door with me still inside, casually said, "Take her around a couple of times."

Choking over the word, I managed to say, "Alone?"

He smiled tenderly.

"But I'm not ready, Bill," I pleaded, the best I could muster at the moment.

"If you weren't," he replied, with a twinkle in those blue eyes, "I wouldn't be sending you up alone. Have a good flight."

With that he turned and walked away.

Betty and Ralph Haesloop.

I was on my own for the first time.

I shakily prepared to go through the routine of calling tower and getting taxiing instructions to go out again, but this time it was very different.

"At least there isn't too much traffic," I said to myself, "and if I can keep my knees from knocking, maybe I can see this momentous occasion through."

It was very important to me that I do well, for all male ears around the airport were keeping tabs on the only woman flyer in their midst.

The plane managed to get off the runway, but complications set in immediately. Bill wasn't there to translate into English the static-y sounds issuing forth from the speaker over my head, now my only contact with Mother Earth. I definitely heard, "Five-ack, ack, Four, eeee, Delta, crackle pop," the registration of the plane, but the rest of the information was lost amid the roar of the motor and my less than normal sense of well being. Vaguely I remembered Bill's advice, "Ask Tower to repeat if you don't understand their instructions."

Picking up the microphone and pushing the button I said, "Elmira Tower,—Five

Four Delta, please repeat."

This they did three times, and still the message was no clearer than when it had come through the first time.

Still wondering what tower's message was and too embarrassed to ask them to repeat a fourth time, I cleared the runway and simultaneously spotted a plane coming in the opposite direction. Putting two and two together I figured this must be what tower was trying to tell me, so I continued upwind until we were out of each other's path and went on to make my 90-degree turn to the left and then another 90 to my downwind leg. Halfway downwind, faithful to the letter of what to do when, I pulled on carburetor heat, slowed down to 95 mph, and pulled on one notch of flaps. Calling tower, I said, "Elmira Tower, Five Four Delta, touch-and-go landing," and hoped that this time I would understand them.

Tower had someone else on the line at this moment. I was approaching base leg and getting more panicky by the second. Why didn't they answer? Routine is everything when learning, and when routine doesn't go according to Hoyle, especially up in the air, a girl feels she needs a friend more than ever before. Doubts about my debut as a flyer were increasing. I was positive that tower had forgotten me.

To add to the confusion three sailplanes, which had been towed skyward from Harris Hill, were dead ahead, floating haphazardly around, as I went downwind. Tower must have seen them, too, for after what seemed an eternity, the loudspeaker crackled to life.

"Five Four Delta, there is a sailplane at twelve o'clock."

I, in turn, replied, "Elmira Tower, Five Four Delta, roger, I see it, and there is also one at nine o'clock and one at three o'clock."

I wondered the best route to take to avoid them. "CAA Rules and Regulations" makes it very clear that sailplanes have the right of way over powered airplanes. I was 800 feet above the ground, which left little room to circle under them and it was hard to anticipate their erratic passage through the air in order to go over them. Somehow I snaked through them, trusting our distance from each other was the legal 500 feet. I turned to base leg and breathed a sigh of relief. What next?

AS I was getting ready to turn on final leg, tower again interrupted my normal landing sequence with, "Five Four Delta, make a three-sixty to the right."

Believe me, I had to really concentrate to think what a "three-sixty" was, and at this point, I wasn't even sure of right and left. By now I was ready to pull over to the side of the road and figure things out—of course utterly impossible to do! My subconscious must have taken over, for I found myself banking the plane to the right and going in a circle. As I levelled off after completing the circle, the tower called, "Five Four Delta, cleared to land."

"If I ever get this thing down, that will be it," I mumbled to myself.

Land it I did, but somehow the plane went speeding down the runway and took off again. I figured the Ralphabet was

(Continued on page 88)

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(Continued from page 87)

overdue for a lecture on insubordination. I flitted around the traffic pattern again with a full-stop landing this last time. An instructor must know a student's limitations, for I am positive three times around would have been one time too many even for my subconscious to have handled.

Bill was waiting for me at the hangar. He beamed profusely. I grinned back, sickly, and attempted to walk. I got to where he was standing, but by now shock was setting in, and I was uttering all sorts of nonsensicals about what had happened, stumbling over words, giggling like a school girl on her first date, legs shaking, and at the same time trying to put up a calm front. I am sure the whole thing was very amusing as seen through Bill's eyes. But he never indicated by so much as an extra puff on his pipe that I acted anything but normal.

Everyone met in the airport dining room for coffee and doughnuts to celebrate, as is the custom when a student gets off the ground and comes back down again alone, alive, and still breathing. I alerted the airport manager, tower manager, tower boys, communications personnel, instructors, and the fire fighter. Anyone watching would have assumed I had soloed without a plane. Bill signed my student license with a "Very Good" to mark this blessed event on the records, and in due time I navigated the car homeward, literally still up in the clouds. The first big step to my private license had been accomplished. END

Paper Aircraft

(Continued from page 33)

plane, but gave equal space to his feline mascot on a 1930 air mail issue.

Sir Charles Kingsford Smith's first crossing of the Tasman Sea in the tri-motored "Southern Cross" was postally recalled by New Zealand; Bleriot's English Channel feat memorialized many times by French air mail stamps. Balbo's exploits, the DO-X flights, zeppelin Atlantic flights, all were prime subjects for world stamp engravers.

Tragic failures are remembered as well. Lithuania, then a free nation, issued a three-stamp series when the "Lithuania I" disappeared on an attempted Atlantic flight, picturing their lost pilots, Captains Dariius and Girenas. When the "Lithuania II" made it, the flight was also good for a special commemorative letter carrier. Other countries have mourned crashes, memorialized missing airmen, with special postage stamps.

Early military aircraft were virtually ignored by post office departments. Austria issued one of the few, a 1915 semi-postal (described later) picturing an observation plane. World War II changed this, as the Axis powers in particular sent dive bombers

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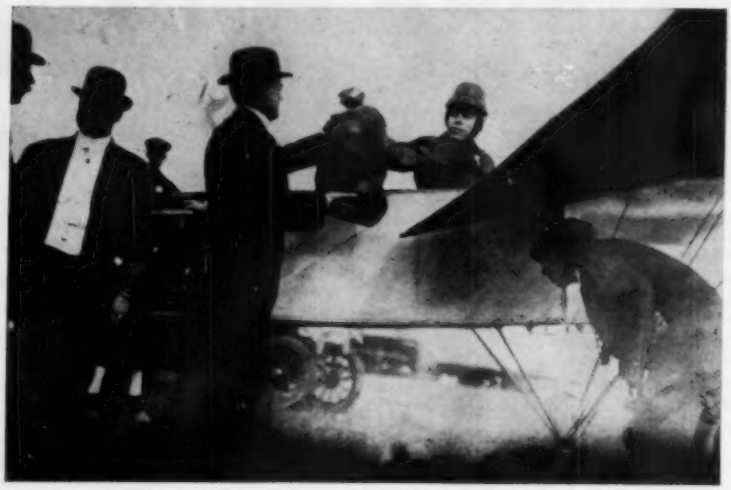

FIRST AIR MAIL

THE FIRST official U.S. air mail delivery, on September 23, 1911, is a historic event in the annals of the United States Post Office.

It was a bold and novel venture. Frank H. Hitchcock was postmaster general at the time. A ten-day aviation meet was in progress at Nassau Boulevard, N. Y.

On the field at this meet were: George Beatty, and his Wright biplane, with its pure, white wings; Captain Thomas Baldwin, and his "Red Devil"; Tom Sopwith, and his great, gray "Family Bus"; and Earle Ovington, and his cream-colored Bleriot monoplane "The Dragonfly."

It was a curious and colorful flock of flying machines.

To this group came a telegram from Postmaster General Hitchcock, to Lieutenant Governor Timothy L. Woodruff. It was a proposal to carry a sack of mail, during the meet, from Nassau Boulevard, N. Y. to Mineola, L. I., a distance of seven miles—not just as an experiment, but as proof of General Hitchcock's conviction that the flying machine could be a most efficient and speedy way to deliver mail.

Ovington offered his services, and had the honor of being the first official U.S. air mail pilot.

To make his title absolutely secure, Mr. Hitchcock, in person, swore him in "to support the Constitution of the United States, defend the mails, etc." Then reaching in his pocket, Mr. Hitchcock came up with a silver dollar, and tossing it to Ovington said: "This will make it official."

Ovington's wife still has that silver dollar. It is now black with age, and the date on it is 1879.

Nowadays, thousands of pounds of letters and packages, bearing the special air mail stamp, are being posted throughout the country.

It's a daily grind now, flying the air mail. Hundreds of bored pilots are doing it every day, as unconcernedly as though they were working on a rural free delivery route.

But it was not so in Ovington's time. Difficult as it was in those days to manage an airplane, it became even more difficult with extra baggage aboard—even a sack of mail, for there was no room in Ovington's plane for anything but himself. He had to balance the bag on his knees, while steering with his feet, and could only peep over it for an occasional glimpse at the wobbly horizon.

And when it came time to deliver the mail, he did it the only way he *could* do it, not daring to make a landing with the heavy bag on his knees. He dropped it overboard!

It had been arranged with the postmaster at Mineola to stand out in the center of a field, and wave a red flag, to show the new postman where to "deliver" the mail. When he reached Mineola and saw the red flag and the postmaster waving it, he aimed at the waiting official, and dropped the bag. It broke, and scattered the letters and postcards all over the field.

The next day they put the mail in a stronger bag, and Ovington continued to fly the mail the rest of the meet.

There were 640 letters, and 1,280 postcards in the sack for that initial flight.

Regular postage was enough to carry each piece, but a special cancellation stamp was used, and a new cachet (or rubber stamp) applied.

Today, one of these letters, stamped "Aerial Mail Station No. 1" and "Aerial Special Dispatch," and dated September 23, 1911, is the envy of every "first flight" collector.

During the nine days that Ovington acted as flying postman, he carried 43,217 pieces of mail.

ADELAIDE OVINGTON

and fighter planes by millions through the mail. Why the United States and Britain didn't "stamp" B-24s, Hurricanes, Lightnings and the Superforts is a major philatelic mystery: it's been demonstrated that such stamp issues are a definite morale factor.

Today's fighting planes get a better break.

France displays the "Mystere IV," the Noratlas, Magister and Provence on 1954 air mails. China and the Philippines picture U. S. built Sabrejets; Russia and some of her satellites postally brag on MiGs, light bombers and various experimental aircraft. Every Iron Curtain citizen should be an expert on identification of Red aircraft because of the repeated copies in his daily mail.

Postage stamps, particularly from major nations, have a terrific publicity value to the featured subject. In our country, for example, 100 million copies of a special or commemorative stamp are printed—and sold. Prior to actual sale of the new stamp, newspaper, magazine, TV and radio stories on the subject's background, exploits or intent blanket the public.

On the first day of sale—usually at a city or town associated with the stamp subject's history — elaborate ceremonies including speeches by governors, cabinet officers, even vice-Presidents are held. Industries connected with the stamp subject mail thousands of colorfully cacheted envelopes to their customer lists from the first-day postoffice. There are more reams of written publicity, news pictures, television appearances. It is saturation publicity "bombing" at its best.

Many foreign governments have realized the promotional possibilities.

Belgium noted the 100,000th passenger safely carried by Sabena helicopter in 1957, the aircraft plainly marked. The Belgians have also pictured DC-4s and Boeing 707s on recent air mail issues. "KLM" with a silhouetted DC-8 was featured on a 1959 Netherlands issue, 40th anniversary of Royal Dutch Airlines. Australia offered "Around The World" passenger service in 1958: the stamp pictured a Super Constellation circling the globe, with "Qantas" lettered on the fuselage.

Czechoslovakia pictured a Russ-built jet liner over the Moscow-Prague-Paris route in 1957; "Lufthansa" came in for a share of postal advertising on German stamps before WWII, and East Germany now promotes the nationalized airline by colorful air mail stamps. "Lloyd's Air Bolivia" recognition came on a 1950 issue from that South American nation, while Chile commemorated its National Air Line's quarter-century of operation in 1954.

Since most foreign countries subsidize at least one commercial airline, the tie-in with official postage stamps is a natural. The U. S. situation is different. Post Office Department officials usually steer clear of "advertising" a particular commercial aircraft or company. Our first air mail stamps, in 1918, pictured a DeHavilland biplane.

The China Clippers were accurately pictured on 1935-37 air mail stamps; then the DC-4 on several issues. On the Air Force's 50th anniversary in 1957, a B-52 and F-104 Starfighters were the featured design. The current jet plane design is a composite, representing no one manufacturer in particular. Whether abandonment of the DC-4 design was due to the anguished lobbying of Boeing, Consolidated and other makers is a well kept Washington secret.

BETWEEN the big Wars, when airplane makers and airlines were fighting for commercial existence, a glance at an "airplane" stamp identified maker, model and type. Switzerland commemorated its 25 years of airline operation in 1944 with fine postal engravings of a DH-3 Haefeli, Fokker tri-motor and a Lockheed "Orion," all used by Swissair at one time. A Zoegling Training Glider, Douglas DC-3 and DC-4 also have been pictured, in fine detail.

France displays its Caravelle, and the Alouette helicopter; Canada the DC-4, Liechtenstein finely impartial with a set showing a Boeing 707, Convair 600, Douglas DC-8 and Bell 47-J on an air mail series. The trend, however, is to the composite or unrecognizable plane design, as the current U. S. air mail stamp. An exception is Russia and her satellites, which exhibit various TU and IL airliners in fine detail.

Semi-postal air mail stamps mentioned earlier are issued showing two amounts, say "five francs plus two francs" (or lire,

(Continued on page 90)

Jules Manger, Jr., Chairman of the Board, Manger Hotels, is seen with his wife and two of their seven children, all ardent flying enthusiasts.

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(Continued from page 89)

pfennigs or zlotys). The purchaser pays seven francs; five is valid for airmail postage, the two francs goes to a pre-designated, government sponsored purpose. Semi-postals are highly popular in Europe where the Red Cross, child welfare, sports meets and air shows are often supported by postage stamp sales.

With fifteen million stamp collectors estimated in North America and perhaps 40 million more worldwide, a good share of new stamps from any country never see an envelope; they're purchased "mint" for airmail collections. A growing number specialize in stamps concerning one branch of aviation: pioneer flights, propeller planes, balloons, dirigibles, jets, helicopters —and now space stamps.

The two activities, aviation and philately, may seem many space years apart, but their history—and future—are as intertwined as two knots on a parachute cord. The sale and use of air mail stamps nursed the aviation infant at its birth. The growing "child" now offers philatelists a plenitude of new designs and discoveries for airmail albums.

The happenings in aeronautics are faithfully recorded in the many tiny pictures of philately.

The first man on Mars could find an airmail letter awaiting him; if not, it's because the stamp to send it is still on the printing press.

Stamps for this article were furnished by the Warren W. King Co., 2321 Parnell Ave., Los Angeles, Calif., and (for the Surinam stamps) by the Surinam Philatelic Agency, 225 W. 34th St., New York. END

Brittain Autopilot

(Continued from page 46)

nounced plans to market the Brittain autopilot under its own trademark for Beech airplanes.

The complete Brittain unit weighs from six to eight pounds, depending on the installation. A Cessna single-engine unit weighs six pounds while a Twin-Bonanza unit weighs eight. The unit is manufactured under patent rights held by Alex Clarkson of Paulspur, Arizona. In the past two years he has manufactured some 300 units under the trade name of "Clarkson Flight Control." Only two of these units have been returned for service or repair.

The unit with which Comanche was equipped was the very latest one offered by Brittain. It had the trim control, which was not available on the Clarkson unit.

Weather for the evaluation was on the marginal side. The ceiling had lifted to about 3,000 feet, but a light rain still was falling. Almost immediately after takeoff, Jack Burlew, Brittain general sales manager, who accompanied us on the flight, pulled that button that turns the set on. It was a moment or two before I realized that the autopilot had assumed yaw and bank control—it was that smooth.

Climbing turns were negotiated simply by turning the control lever in the desired direction; pitch control was, in this case, effected by use of the aircraft's trim. As long as the control lever was off center, the airplane continued to turn, but if it was returned to neutral, the airplane would then slowly and smoothly return to straight flight. Normal roll-out procedure, however, is to place the control lever full against the turn—this results in a normal rate of roll—as the airplane approaches a wing level attitude, the control is returned to the neutral indent position.

Initially, in flight, the Comanche had a tendency to fly right wing low. This was corrected through the use of the trim system; thumbing the control to the left brought the right wing up and straight flight resulted. Trimming the system simply moves the position of the indent.

Several turns were accomplished; the most noticeable features are the smoothness of control and the high degree of coordination achieved. Turn entries and roll-outs are satin smooth with the ball remaining centered throughout.

Turns of varying rates are made by varying the displacement of the turn control knob. Twisting the knob halfway results in a degree and a half per second turn. One third results in one degree per second turn. Timed turns are duck soup here!

The autopilot may be engaged in any flight attitude. The immediate response is to correct to straight flight attitude if the turn control is in the indent position. If the turn control is displaced, the recovery will then be made to the banking attitude to which the turn control is set. This coupled with the complete independence from the flight instruments provides a remarkable safety feature. If instrument failure occurs, or the pilot inadvertently flies into weather and becomes confused, he would merely have to snap on the autopilot and place the turn control in the desired position to fly out of his predicament—automatic recovery from unusual attitudes is promptly made—no chance for vertigo here.

Pitch control on the Brittain was noticeable by its absence. While the autopilot will for the most part be used to maintain straight flight while the pilot navigates, the turn control cannot be used to the fullest because of the characteristic of most airplanes to descend as the vertical lift is reduced in turns. The Comanche was no exception, for unless we applied elevator trim, we would invariably descend on turn entries. And if the turn was then trimmed, we would climb on the roll-out.

Brittain has a pitch control as a separate unit which has been approved. It will be available in early 1962 and will be a "must" addition if full benefit of the autopilot is to be attained. In the interim, the airplane's pitch trim can be used quite successfully in maintaining level flight. It will, at least, make the pilot trim conscious.

HEADING hold, as such, is not part of the present system. Design is based largely on the same principle of precession as the turn indicator; it will hold straight flight and do coordinated (rudder and ailerons) turns, but since it has no connection with the directional gyro or the magnetic compass, it cannot hold a specific heading. Once trimmed up, however, the Comanche seemed to hold the compass heading fairly well, and there was very little drift off.

From a position of straight flight and on a heading of 255 degrees, we applied and forcibly held full left rudder. The result was a right wing low, slipping but straight flight path. The heading moved over to 250 and remained there. When the rudder was released, coordinated flight was resumed and the heading remained 250. According to Burlew, the autopilot will do an excellent job of maintaining a given flight condition with an engine out on a twin-engine airplane. The above trial seemed to bear this out.

Dropping to a lower altitude, we managed to find a small amount of turbulence, but it was insufficient to really evaluate the autopilot's rough air characteristics. We applied 2,400 rpm and 24 inches mp and got an indicated 175 mph; even in the choppy air the autopilot smoothly maintained a straight flight path. There was no roughness, no jerky response, just a smooth positive control reaction.

The Brittain (Clarkson) autopilot is based largely around design features found in the standard vacuum turn indicator. In the latter, the gimbal ring encircles the gyro in a horizontal plane and is pivoted fore and aft, thus allowing the gyro to rotate freely around the lateral and longitudinal axis. Rotation around the vertical axis is restricted, however. Precessional forces from movement about this axis are transmitted through a system of leverage and dampeners to give appropriate and stable indications to the turn needle.

In the autopilot, the housing case is pitched upward at the rear at from a 37 and a half to a 42-degree angle (dependent on the airplane in which it is to be installed), thereby restricting rotation of the gyro about the longitudinal as well as the vertical axis. Displacement about either of these two axes causes the resulting precession, through leverage, to open and close small orifices which direct or restrict suction to appropriate neoprene sealed cylinder and piston actuators. These, in turn, are connected directly to the appropriate control cable for yaw movements to the rudder

In a static flight condition, suction on the actuators would be equal and no forces would be applied. If a wing dropped, the gyro simultaneously would precess, opening one orifice and closing its opposite, thus creating a differential suction. The pistons would move, applying control forces to the ailerons and rudder, returning the airplane to straight flight and a balanced condition.

Brittain uses a standard turn indicator case to house the guidance element of the autopilot.

While the turn indicator requires only about two inches of suction for operation, the autopilot requires a whopping eight inches for normal operation although it will operate quite satisfactorily on as little as five inches. Reduced suction causes reduced rotor rpm, which in turn causes faster turns in the airplane.

The average suction pump on an aircraft is capable of reducing pressure from one-third to one-half atmospheric. Thus with half the air below 18,000 feet, at least five or six inches of suction would be available to that altitude. Operations above that altitude would no doubt call for some sort of a suction boost. For aircraft not equipped with a suction pump, the autopilot will operate satisfactorily off a standard eight-inch venturi tube.

Prototype autopilots have operated for as long as 1,700 hours without malfunction. Guidance elements are guaranteed for one year against wear or malfunction. After that the element will be repaired or replaced for a flat rate of $100. Actuators are guaranteed for five years.

In addition to the pitch control, which is to become available, Brittain also has a magnetic heading lock to be available next year. It is tied into the mag compass instead of the usual DG. END

I Learned About Flying

(Continued from page 50)

caution—magnetic compass may be as much as ten degrees in error with heater-blower operating. With the outside air temperature at minus 55 degrees Centigrade, the heater-blower was working overtime, and in the maze of airways over Los Angeles, I simply could not afford to be 10 degrees off course. I called for assistance.

"Bakersfield Radio, this is Air Force Jet Two Niner One Five Niner, over." All I heard was the quiet crackle of static in the earphones of my helmet. "Bakersfield Radio, Bakersfield Radio, Air Force Jet Two Niner One Five Niner, how do you

(Continued on page 92)

Los Angeles to New York VFR

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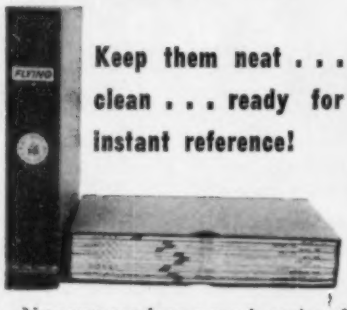

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(Continued from page 91)

read? Over." Nothing. "Any radio facility reading Air Force Jet Two Niner One Five Niner, give a call on three zero one point four, over." Good grief, I thought, don't tell me my radio's out, too!

A faint voice sounded through the static. ". . . Five Niner, this is Shady Lady on Guard, can we be of assistance?"

A flood of relief swept through me as I spun the channel selector of the radio to the emergency channel. Shady Lady is a GCI site, I thought happily, they'll have radar that can steer me to Bakersfield, or maybe even March!

"Roger, Shady Lady, One Five Niner at angels three five, navigation instruments out and in the weather. Request assistance to letdown at March AFB."

Static. I called again, but heard no reply. I had lost contact with Shady Lady. This was not good. If the winds were right, I should have been over Bakersfield, and I turned to the heading for Los Angeles, my next checkpoint. The mag compass bobbled and swung in its case, and I may easily have been 20 degrees off course. With civilian airliners crowding the airways beneath me, I couldn't dive down to get under the weather. It was also possible that the ceiling had lowered during my flight, and there wouldn't *be* any "under the weather." I had only one card left to play. The inverter switch went back to *main*, and the red light reluctantly went out. The ghostly voice of a forgotten instructor in Cadets rang in my mind. "If you ever get in trouble, don't hesitate to turn that dial on your IFF set to *Emergency*. It gives a Mayday pattern on the GCI radar screens that can't be missed. They'll drop everything to help you."

The inverters on this plane also gave power to the IFF equipment, and I prayed that there would be enough life in the main inverter to get a distress signal on somebody's radar. There was. As soon as the selector dial stopped at *emergency*, a calm voice came clearly in the earphones, as if the man were in the back seat of my plane talking to me.

"Aircraft squawking Mayday, this is March Rapcon. Can we be of assistance?"

I pressed the mike button.

"Roger, March Rapcon, Air Force Jet Two Niner One Five Niner at angels three five, approximately over Los Angeles omni in the weather, all navigation instruments out. Request vector to March and a GCA pickup."

"Roger, Five Niner" he answered, "we have a target over the ocean 15 miles west of Catalina Island. Turn to heading zero eight zero degrees, begin descent to angels two five." The voice was calm and nonchalant.

I continued my left turn around to the general direction of zero eight zero, and started to let down through the featureless world of grey.

"March Rapcon, be advised Five Niner has negative directional indicator, requests no-gyro letdown and GCA to full stop at March, over."

"Roger," came the unruffled voice. "Roll out . . . now, call passing angels two seven."

I was elated, and felt as secure as if I were already in the chocks. "Roger-dodger," I called, "Wil-co."

I followed his directions as he led me through the tangled airways and traffic in the Los Angeles sky. It was simple. It was ridiculously easy. In a minute he was saying, "You are now turning to a seven-mile final for GCA no-gyro approach. Complete your pre-landing check and contact the final controller on three six three point eight megacycles."

In 40 seconds I was looking down to 13,000 feet of white concrete; in 40 more my wheels spun on that huge runway and a school of firetrucks raced along at my side, their red lights flashing. I don't think I've ever smiled so broadly in my life.

I don't have to say my opinion of the value of the man on the ground took an abrupt about face. In fact it turned into sheer admiration when the calm voice said, "Five Niner, you have a follow me truck waiting at the end of the runway. You can park your airplane to the east of the tower." END

FLYING CALENDAR

September 2-4—Annual Schweizer 1-26 One-Design Soaring Regatta, Harris Hill, Elmira, N. Y.

September 4—Huntingburg Jaycee Lincoln Land Air Show, Navy Blue Angels, Huntingburg Airport, Indiana.

September 4—End of coast-to-coast Silver Wings relay race, Zahn's Airport, Amityville, Long Island, N. Y.

September 5-9—Flying Physicians' Assn. clinical meeting, Holiday Hotel, Reno, Nevada.

September 9—Chattanooga CAP aircraft show at Lovell Field.

September 4-10—Society of British Aircraft Constructors, flying display and exhibition, Farnborough, England.

September 14-17—Florida Air Pilots Assn. Ruby Rendezvous and Mountain Jamboree. Contact Robert Mulgrew, 1510 Moffett St., Hollywood, Fla.

September 10-12—National Aeronautic Assn. national convention, Westbury, L. I.

September 13-14—International Operations and Maintenance Symposium, Airwork Corp., Millville, N. J.

September 15-16—Annual Convention, National Assn. of State Aviation Officials, Miami Beach, Fla.

September 16-17—Experimental Aircraft Assn. Dayton Chapter 48 Fly-in, Middletown, Ohio. Rain date Sept. 23-24.

September 17—Visalia Flying Clubs' annual Western Fly-in. Visalia, Calif.

September 17—Airport Day, fly-in, Hamilton Airport, Polo, Ill.

September 17—Hagerstown Jaycee fly-in breakfast, Hagerstown, Indiana.

September 17—Midland Texas Jaycees air show, Midland, Texas.

September 21-24—Air Force Assn. convention and Aerospace Panorama, Convention Hall, Philadelphia, Pa.

September 22-24—Fall section meeting, southwest section The Ninety-Nines, Inc., Torrance Municipal Airport, Calif.

September 24—Air show, fly-in breakfast, McGugin Field, Coffeyville, Kansas.

September 26-28—National Business Aircraft Assn. (NBAA) Annual Convention, Tulsa, Oklahoma.

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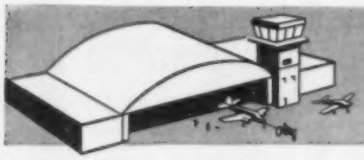

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BRIEFINGS...

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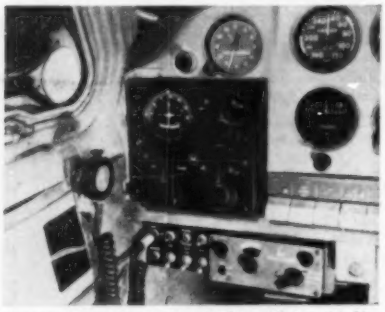
under which the two-place autogyro is being certified. Included also in the data submitted was a preliminary flight test investigation covering all requirements to be met during the FAA official flight test program which is now underway at the Umbaugh facilities at Hagerstown, Md. Under a revised agreement with Fairchild Stratos Division (formerly Fairchild Aircraft) Umbaugh leases facilities from Fairchild and the latter will manufacture and treat metal parts for the Umbaugh 18.

Installation of the new Motorola M-135 Navcom system in 11 airplanes, owned and operated by the Air Taxi Co., of Red Bank, N. J., was recently completed at West-



chester County Airport, White Plains, N. Y., by Flight Electronics Corp. Pictured here is an M-135 installation in an Air Taxi Beechcraft. Flight Electronics took delivery on the new Motorola systems last June, and reports trouble-free operations to date.

Husband and wife flying teams are not new to aviation so it should come as little surprise to note a trend developing toward the "two-plane" family. Such is the case with John and Jayne Slate of Granby, Mass. Both private pilots, they now own and operate two planes, a Piper J5-C (left)

and an Aeronca Sedan. The Sedan, recently converted to floats, is currently based at the Flying Eagle Lodge at Lake Maranacook, Winthrop, Me., (all seaplane pilots welcome) and used for flying out to remote fishing and hunting areas. The J5-C provides transportation to and from the Lodge, and wherever else the Slates may desire.

Successful graduates of the Agricultural Aviation Academy at Minden, Nev., are now issued wallet-size "qualifications" cards as diplomas. Anticipating FAA's forthcoming regulations governing the agricultural flying industry, the new card certifies that the one possessing it is a qualified "Ag" pilot.

A newly organized commercial helicopter charter firm, Pine Belt Helicopters of Placerville, Calif., is the first user of Bell's turbo-supercharged 47G-3B. The rotorcraft was flown from the Bell plant in Fort Worth, Tex. by Don Huntsman and Ron Crowe, partners in the new firm. The sec-

ond and third 47G-3Bs (in photo) were picked up soon after by Richard D. Eccles, president, and Al Houbein, operations manager of Calicopters headquartered in Stockton, Calif. Calicopters, a leading commercial helicopter operator, has 12 Bell helicopters in its fleet, which are utilized extensively in high-altitude construction work, powerline patrol, forest fire fighting and other missions.

Frequency of base inspections for air taxi operations has been extended from 60 days to six months following a recent Washington conference on CAR requirements for fixed-wing and rotary-wing air taxi service. Instrument flight checks and en route inspections will receive the same attention as before. Announcing the time extension, FAA noted the air taxi business now numbers 2,700 operators; 937 of which operate multi-engined planes and 102 operating helicopters. A total of 480 are authorized to operate in instrument weather; 53 operate on regular schedules, and 509 maintain frequent or regular service.

Publication of a detailed working manual as a guide to the financing of new and used aircraft has been announced as a public service by the American Mercury Insurance Co., of Washington, D. C. The manual is being distributed to the banking industry and lending institutions of the United States to help them to evaluate loan applications, insurance coverage and follow-through procedures on details of registering a loan with the proper Federal agencies. The service also is to acquaint bankers with the growing demand for financing in the general aviation field.

Field Aviation Co., Ltd., Toronto, Ottawa and Calgary, Canada has been appointed exclusive representative on all Beech Aircraft products by the Canadian Government. This special representation makes use of Fields facilities at Toronto and Calgary to provide and service Beech aircraft, spares, weapon systems components and pilotless subsonic and supersonic targets.

The world's air transport fleet, at the end of 1960, according to recent report by the International Civil Aviation Organization (ICAO) numbered 5,014 aircraft among its 84-member states—the USSR and Red China are not members. Comprising the fleet were 388 turbojets; 723 turboprops; 1,621 four-engine piston aircraft and 2,282 twin-engine piston aircraft. The reliable old DC-3 still outnumbered any other single type with a total of 1,296 in operation. While the piston-engine group represented 77.9 per cent of the total world fleet, it provided only 50 per cent of total productive capacity. Only 7.7 per cent of the fleet, the turbojet aircraft accounted for 30 per cent of capacity; and the turboprops, representing 14 per cent numerically, accounted for 20 per cent of productive capacity.

Two charming contestants from Kansas, Mary Ann Noah (left), pilot, of Mission, and Joan Manda of Pleasant Hill, in this year's All Women's Transcontinental Air Race, won the annual FLYING Magazine award of $100 for the best score made by a

crew whose combined total time as a pilot in command is 500 hours or less. Sponsored by King Radio of Olathe, Kan., they flew a Cessna 175 from San Diego to Atlantic City at a plus 7 knots over their handicap "par" speed of 117 knots. Each is married, has four children.

First-place winner of the TAR was Mrs. Frances Bera of Long Beach, Calif. Flying solo in her 11th TAR in a Beechcraft E35 Bonanza, her score was a plus 14 knots over

a "par" speed of 144. An ATR-rated pilot with 10,000 hours, Mrs. Bera was winner in 1953, 1955, 1956 and 1958; and copilot of the winning team in 1951.

"Senior Citizens" may now enjoy a one-third reduction in fares on Mohawk Airlines if they travel between the hours of midnight and 1 p.m. Mohawk calls this plan the "Golden Age" program and it has CAB approval. Eligible persons—men of 65 or over and women 62 or over—apply to Mohawk, submit proof of age and receive an annual Golden Age card for which there is a fee of $5. Thereafter, a Golden Ager merely makes a conventional reservation and shows his Club Card.

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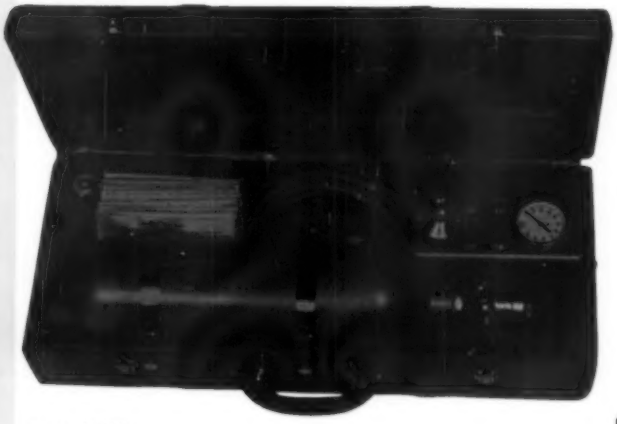

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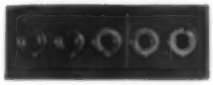

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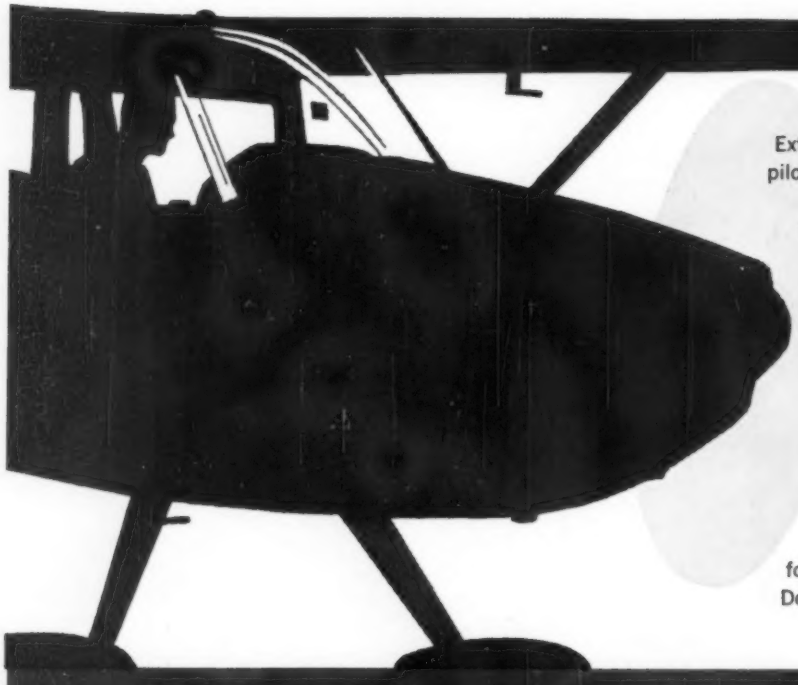

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